Answer Key

Geometry
Regents Questions

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Notation

A code next to each Regents Question number states from which Geometry Common Core Regents exam the question came. For example, AUG '18 [25] means the question appeared on the August 2018 as question 25.

Chapter 1. Basic Geometry

1.1 Lines, Angles and Shapes

1. JAN '16 [6] Ans: 1

1.2 Pythagorean Theorem

1. JAN '16 [32]

   $\frac{16}{9} = \frac{x}{20.6}$; $x \approx 36.6$

   $36.6^2 + 20.6^2 = c^2$

   $1763.92 = c^2$

   $42 \approx c$

1.3 Perimeter and Circumference

There are no Regents exam questions on this topic.

1.4 Area

1. JAN '17 [8] Ans: 1
2. AUG '17 [20] Ans: 1
3. JAN '19 [18] Ans: 1
4. JUN '19 [2] Ans: 3
5. AUG '19 [17] Ans: 4
6. JAN '16 [30]

   Dish A

   $d_A = \frac{40{,}000}{\pi(25.5)^2} \approx 19.6$

   $d_B = \frac{72{,}000}{\pi(37.5)^2} \approx 16.3$

7. AUG '17 [34]

   $x^2 + x^2 = 58^2$

   $2x^2 = 3364$

   $x = \sqrt{1682}$

   $A = \left(\sqrt{1682} + 8\right)^2 \approx 2402.2$

8. JAN '19 [31]

   Area of outer circle − Area of inner circle $= \pi 30^2 - \pi 20^2 = 500\pi$

   Area of each $\square = 90 \times 10 = 900$

   Total area $= 500\pi + 2(900)$

   $\approx 3{,}371$ sq. ft

Chapter 2. Coordinate Geometry

2.1 Forms of Linear Equations

There are no Regents exam questions on this topic.

2.2 Parallel and Perpendicular Lines

1. JUN '15 [9] Ans: 1
2. AUG '15 [10] Ans: 1
3. JAN '16 [2] Ans: 4
4. JAN '17 [1] Ans: 3
5. JUN '17 [19] Ans: 2
6. JAN '18 [20] Ans: 1
7. JUN '18 [12] Ans: 2
8. AUG '18 [11] Ans: 1
9. JUN '19 [16] Ans: 2
10. AUG '19 [8] Ans: 1
11. JAN '19 [25]

    $y = \frac{2}{3}x - \frac{7}{3}, m = \frac{2}{3}$

    $y - 6 = \frac{2}{3}(x - 2)$
12. JAN '20 [31]

    $y = \frac{5}{4}x - \frac{5}{2}, m = \frac{5}{4}$

    $y - 12 = -\frac{4}{5}(x - 5)$

2.3 Distance Formula

1. JUN '15 [3] Ans: 3
2. JAN '16 [15] Ans: 2

2.4 Midpoint Formula

There are no Regents exam questions on this topic.

2.5 Perpendicular Bisectors

1. JUN '16 [12] Ans: 1
2. AUG '17 [24] Ans: 4
3. JUN '22 [20] Ans: 4

2.6 Directed Line Segments

1. FALL '14 [14] Ans: 4
2. AUG '16 [18] Ans: 4
3. JAN '17 [20] Ans: 1
4. JUN '17 [15] Ans: 2
5. AUG '17 [17] Ans: 1
6. JAN '18 [6] Ans: 1
7. JUN '18 [14] Ans: 2
8. AUG '18 [15] Ans: 1
9. JAN '19 [15] Ans: 1
10. JUN '19 [19] Ans: 4
11. AUG '19 [3] Ans: 3
12. JAN '20 [5] Ans: 4
13. JUN '22 [22] Ans: 2
14. AUG '22 [13] Ans: 1
15. JUN '15 [27]

    $P_x = -6 + \frac{2}{5}(4 + 6) = -2;$

    $P_y = -5 + \frac{2}{5}(0 + 5) = -3$

    $P(-2, -3)$

16. AUG '15 [31]

$E_x = 1 + \frac{2}{5}(16 - 1) = 7;$

$E_y = 4 + \frac{2}{5}(14 - 4) = 8$

$E(7,8)$

17. JAN '16 [27]

$J_x = -2 + \frac{2}{3}(4 + 2) = 2;$

$J_y = 1 + \frac{2}{3}(7 - 1) = 5$

$J(2,5)$

18. JUN '16 [26]

$P_x = 4 + \frac{4}{9}(22 - 4) = 12;$

$P_y = 2 + \frac{4}{9}(2 - 2) = 2$

$P(12,2)$

Chapter 3. Polygons In The Coordinate Plane

3.1 Triangles in the Coordinate Plane

1. JAN '16 [18] Ans: 1
2. JUN '16 [14] Ans: 4
3. AUG '16 [15] Ans: 3
4. AUG '15 [33]

$m_{\overline{BC}} = -\frac{3}{2}$ $\quad m_{\perp} = \frac{2}{3}$

The right ∠ may be at B or C.

Right ∠ at B means:

$-1 = \frac{2}{3}(-3) + b$ $\quad 3 = \frac{2}{3}x + 1$

$b = 1$ $\quad x = 3$

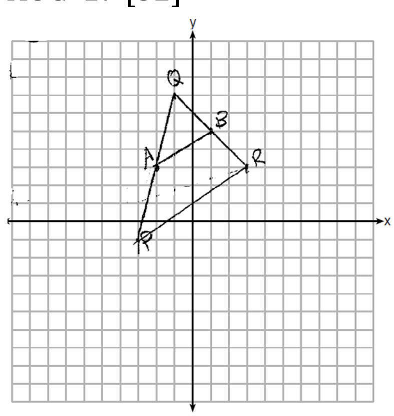
Right ∠ at C means:

$-4 = \frac{2}{3}(-1) + b$ $\quad 3 = \frac{2}{3}x - \frac{10}{3}$

$b = -\frac{10}{3}$ $\quad x = \frac{19}{2} = 9.5$

Either answer, $x = 3$ or $x = 9.5$, is correct.

5. AUG '17 [32]



$A(-2,3)$ and $B(1,5)$

$m_{\overline{AB}} = \frac{5-3}{1+2} = \frac{2}{3}$

$m_{\overline{PR}} = \frac{3+1}{3+3} = \frac{4}{6} = \frac{2}{3}$

$\overline{AB} \parallel \overline{PR}$ because same slopes.

$AB = \sqrt{3^2 + 2^2} = \sqrt{13}$

$PR = \sqrt{6^2 + 4^2} = \sqrt{52} = 2\sqrt{13}$

Therefore, $AB = \frac{1}{2}PR$.

6. JUN '18 [32]

$AB = \sqrt{5^2 + 1^2} = \sqrt{26}$

$BC = \sqrt{4^2 + 4^2} = \sqrt{32}$

$AC = \sqrt{1^2 + 5^2} = \sqrt{26}$

$\triangle ABC$ has two ≅ sides, not three, so it is isosceles and not equilateral.

7. JAN '19 [30]

No. (a) If $\overline{EG}$ is a median, then G is the midpoint of $\overline{DF}$.

But midpoint of $\overline{DF}$ is $\left(\frac{1+4}{2}, \frac{-1+2}{2}\right) =$ (2.5,0.5), or

(b) If $\overline{EG}$ is a median, then $DG = GF$.

But, $DG = \sqrt{2^2 + 2^2} = \sqrt{8}$ and $GF = \sqrt{1^2 + 1^2} = \sqrt{2}$.

8. JAN '19 [32]

$AC = \sqrt{3^2 + (-5)^2} = \sqrt{34}$

$BC = \sqrt{(-5)^2 + (-3)^2} = \sqrt{34}$

Isosceles because $AC = BC$

$m_{\overline{AC}} = \frac{-1-4}{1-(-2)} = -\frac{5}{3}$ $\quad m_{\overline{BC}} = \frac{-1-2}{1-6} = \frac{3}{5}$

$\overline{AC} \perp \overline{BC}$ because their slopes are opp reciprocals, so $\angle C$ is a right ∠.

3.2 Quadrilaterals in the Coordinate Plane

1. AUG '15 [22] Ans: 4
2. AUG '16 [14] Ans: 1
3. JAN '17 [19] Ans: 3
4. AUG '19 [2] Ans: 3
5. FALL '14 [11]

   Midpoint of $\overline{MT}$ is $\left(\frac{0+4}{2}, \frac{-1+6}{2}\right) = \left(2, \frac{5}{2}\right)$.

   $m_{\overline{MT}} = \frac{6+1}{4-0} = \frac{7}{4}$. In a rhombus, diagonals are $\perp$, so $m_{\overline{AH}} = -\frac{4}{7}$.

   $y - \frac{5}{2} = -\frac{4}{7}(x - 2)$

   The diagonals, $\overline{MT}$ and $\overline{AH}$, of rhombus *MATH* are $\perp$ bisectors of each other.
6. JUN '15 [36]

   $m_{\overline{TS}} = -\frac{5}{3}$ $m_{\overline{SR}} = \frac{3}{5}$

   Since the slopes of $\overline{TS}$ and $\overline{SR}$ are opp reciprocals, they are $\perp$ and form right $\angle$.

   $\triangle RST$ is a right $\triangle$ ($\angle S$ is a right $\angle$)

   $P(0,9)$

   $m_{\overline{RP}} = -\frac{5}{3}$ $m_{\overline{PT}} = \frac{3}{5}$

   Since the slopes of all four adjacent sides are opp reciprocals, they are $\perp$ and form right $\angle$'s. Quad *RSTP* is a ▭ because it has four right $\angle$'s.
7. JAN '17 [31]

   $(1,3)$ and $(-3,-3)$
8. JUN '17 [35]

   $PQ = \sqrt{5^2 + 5^2} = \sqrt{50}$

   $QR = \sqrt{(-7)^2 + 1^2} = \sqrt{50}$

   $RS = \sqrt{(-5)^2 + (-5)^2} = \sqrt{50}$

   $PS = \sqrt{(-7)^2 + 1^2} = \sqrt{50}$

   PQRS is a rhombus b/c all sides are $\cong$.

   The slope of $\overline{PQ}$ is 1 and the slope of $\overline{QR}$ is -7. Because the slopes of adjacent sides are not opp reciprocals, they are not $\perp$ and do not form a right $\angle$. Therefore, *PQRS* is not a square.
9. JAN '18 [35]

   $PA = \sqrt{(-4+1)^2 + (5+6)^2} = \sqrt{130}$

   $AT = \sqrt{(5+4)^2 + (-2-5)^2} = \sqrt{130}$

   $PA = AT$, so $\triangle PAT$ is isosceles.

   $R(2,9)$

   $m_{\overline{PA}} = -\frac{11}{3}$ and $m_{\overline{RT}} = -\frac{11}{3}$, so $\overline{PA} \parallel \overline{RT}$.

   $RT = \sqrt{(5-2)^2 + (-2-9)^2} = \sqrt{130}$, so $\overline{PA} \cong \overline{RT}$.

   PART is a ▱ because it has a pair of opp sides that are both $\cong$ and $\parallel$.
10. AUG '18 [35]

   $m_{\overline{MH}} = \frac{6}{10} = \frac{3}{5}$ and $m_{\overline{AT}} = \frac{6}{10} = \frac{3}{5}$

   $m_{\overline{MA}} = -\frac{5}{3}$ and $m_{\overline{HT}} = -\frac{5}{3}$

   $\overline{MH} \parallel \overline{AT}$ and $\overline{MA} \parallel \overline{HT}$, so *MATH* is a ▱ since both sides of opp sides are $\parallel$.

   Since their slopes are negative reciprocals, $\overline{MA} \perp \overline{AT}$ and $\angle A$ is a right $\angle$. *MATH* is a ▭ because it is a ▱ with a right $\angle$.

11. JUN '19 [32]

$m_{\overline{AD}} = \frac{0-6}{1-(-1)} = -3$

$m_{\overline{BC}} = \frac{-1-8}{6-3} = -3$

$\overline{AD} \parallel \overline{BC}$ because their slopes are equal, so ABCD is a trapezoid.

$AC = \sqrt{(-1-6)^2 + (6+1)^2} = \sqrt{98}$

$BD = \sqrt{(8-0)^2 + (3-1)^2} = \sqrt{68}$.

$ABCD$ is not an isosceles trapezoid because its diagonals are not ≅.

12. AUG '19 [35]

$AB = \sqrt{(-5-1)^2 + (3-2)^2} = \sqrt{37}$

$BC = \sqrt{(-5+6)^2 + (3+3)^2} = \sqrt{37}$

$\triangle ABC$ is isosceles because $AB = BC$.

$D(0, -4)$

$AD = \sqrt{(1-0)^2 + (2+4)^2} = \sqrt{37}$

$CD = \sqrt{(-6-0)^2 + (3+4)^2} = \sqrt{37}$

$m_{\overline{AB}} = \frac{3-2}{-5-1} = -\frac{1}{6}$ $\quad m_{\overline{BC}} = \frac{3+3}{-5+6} = 6$;

$\overline{AB} \perp \overline{BC}$ (slopes are opp reciprocals), so $\angle B$ is a right ∠;

$ABCD$ is a square because all four sides are ≅ and it has a right ∠.

13. JAN '20 [32]

$NA = \sqrt{(1+4)^2 + (2+3)^2} = \sqrt{50}$

$AT = \sqrt{(8-1)^2 + (1-2)^2} = \sqrt{50}$

$TS = \sqrt{(3-8)^2 + (-4-1)^2} = \sqrt{50}$

$SN = \sqrt{(-4-3)^2 + (-3+4)^2} = \sqrt{50}$

All four sides are ≅, so $NATS$ is a rhombus.

14. AUG '22 [33]

$m_{\overline{HY}} = \frac{9-6}{2+3} = \frac{3}{5}$; $\quad m_{\overline{PE}} = \frac{-4+1}{3-8} = \frac{3}{5}$;

$m_{\overline{HE}} = \frac{6+4}{-3-3} = -\frac{5}{3}$; $\quad m_{\overline{YP}} = \frac{9+1}{2-8} = -\frac{5}{3}$;

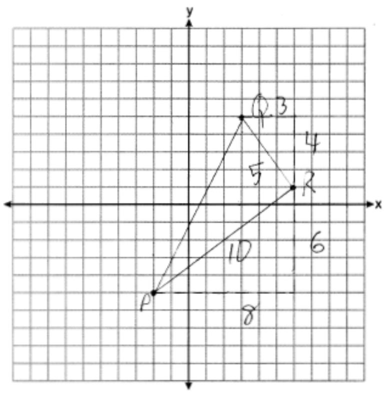
HYPE is a ▱ since both pairs of opp sides are ∥ (slopes are equal)

$\overline{HY} \perp \overline{HE}$ (slopes are opp reciprocals)

HYPE is a ▭ (▱ with a right ∠)

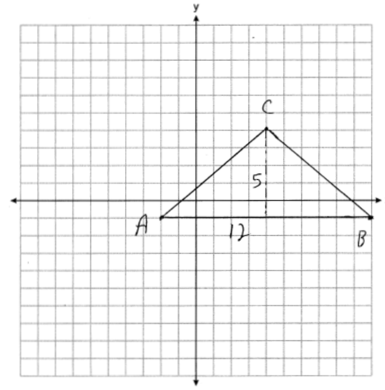
3.3 Perimeter and Area using Coordinates

1. JUN '16 [22] Ans: 3
2. JUN ’17 [2] Ans: 3
3. AUG ’17 [3] Ans: 3
4. JUN ’18 [15] Ans: 1
5. AUG ’18 [8] Ans: 4
6. JAN ’19 [21] Ans: 4
7. JAN ’20 [18] Ans: 2
8. AUG ’22 [14] Ans: 4
9. JUN ’19 [26]



$A = \frac{1}{2}(5)(10) = 25$

10. AUG ’19 [28]



$A = \frac{1}{2}(5)(12) = 30$

Chapter 4. Rigid Motions

4.1 Translations

1. JUN '22 [35]

   $AB = \sqrt{(-2+7)^2 + (4+1)^2} = \sqrt{50} = 5\sqrt{2}$

   $AC = \sqrt{(-2+3)^2 + (4+3)^2} = \sqrt{50} = 5\sqrt{2}$

   $AB = AC$, so $\triangle ABC$ is isosceles

   $A(-2,4) \rightarrow A'(3,-1)$

   $B(-7,-1) \rightarrow B'(-2,-6)$

   $C(-3,-3) \rightarrow C'(2,-8)$

   $A'C' = AC = 5\sqrt{2}$ because translations preserve distance

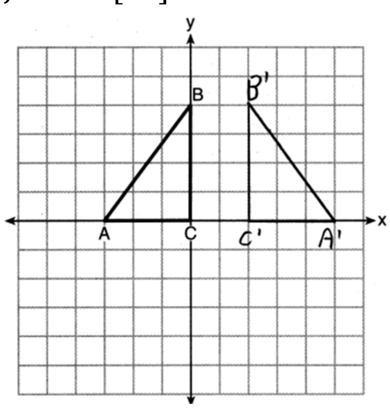
   $AA' = \sqrt{(3+2)^2 + (-1-4)^2} = \sqrt{50} = 5\sqrt{2}$

   $CC' = \sqrt{(2+3)^2 + (-8+3)^2} = \sqrt{50} = 5\sqrt{2}$

   $AA'C'C$ is a quad with 4 ≅ sides, so it is a rhombus

4.2 Line Reflections

1. AUG '22 [1] Ans: 2
2. JAN '16 [25]



4.3 Rotations

1. FALL '14 [2] Ans: 4
2. JAN '16 [11] Ans: 4
3. AUG '16 [5] Ans: 1
4. JUN '22 [5] Ans: 3
5. AUG '22 [9] Ans: 1
6. AUG '16 [29]

   m$\angle P$ = m$\angle L = 47°$ because rotations preserve ∠'s.

   m$\angle M = 180 - (47 + 57) = 76$ because the ∠'s of a △ add to 180°.

4.4 Point Reflections [NG]

There are no Regents exam questions on this topic.

4.5 Map a Polygon onto Itself

1. FALL '14 [15] Ans: 2
2. JUN '15 [10] Ans: 1
3. AUG '15 [5] Ans: 1
4. JAN '17 [17] Ans: 4
5. JUN '17 [7] Ans: 1
6. AUG '17 [6] Ans: 3
7. AUG '17 [22] Ans: 4
8. JAN '18 [15] Ans: 3
9. JUN '18 [19] Ans: 3
10. AUG '18 [17] Ans: 3
11. JAN '19 [4] Ans: 3
12. JUN '19 [4] Ans: 4
13. AUG '19 [23] Ans: 4
14. JAN '20 [11] Ans: 3
15. JUN '22 [4] Ans: 1
16. AUG '22 [5] Ans: 4
17. AUG '16 [27]

    $\frac{360}{6} = 60$

Chapter 5. Dilations

5.1 Dilations of Line Segments

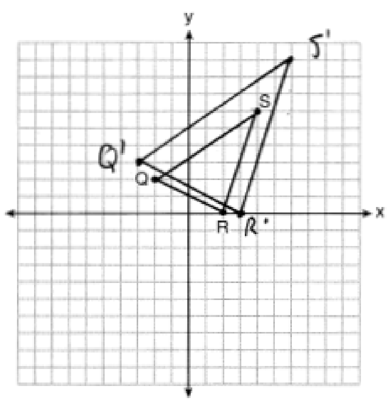
1. JUN '15 [18] Ans: 1
2. JAN '16 [10] Ans: 2
3. JUN '16 [2] Ans: 4
4. AUG '16 [21] Ans: 4
5. JAN '17 [13] Ans: 1
6. JUN '17 [6] Ans: 3
7. AUG '17 [10] Ans: 1
8. JAN '19 [1] Ans: 4
9. JUN '19 [5] Ans: 1
10. AUG '19 [1] Ans: 2
11. AUG '17 [29]

    $A'B' = \frac{1}{2}AB =$

    $\frac{1}{2}\sqrt{(5-2)^2 + (-1-3)^2} = \frac{1}{2}\sqrt{25} = 2.5$

5.2 Dilations of Polygons

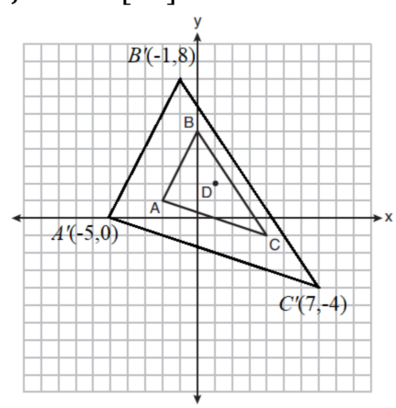
1. JUN '15 [16] Ans: 2
2. AUG '15 [6] Ans: 4
3. AUG '15 [20] Ans: 1
4. AUG '15 [23] Ans: 1
5. JAN '18 [11] Ans: 1
6. JUN '18 [5] Ans: 4
7. AUG '18 [23] Ans: 3
8. JUN '22 [1] Ans: 2
9. JUN '22 [3] Ans: 1
10. AUG '22 [6] Ans: 1
11. JAN '17 [32]



A dilation preserves slope, so the slopes of $\overline{QR}$ and $\overline{Q'R'}$ are equal.

Therefore, $\overline{Q'R'} \parallel \overline{QR}$.

12. JUN '18 [26]



5.3 Dilations of Lines

1. FALL '14 [3] Ans: 2
2. FALL '14 [16] Ans: 2
3. JUN '15 [22] Ans: 1
4. AUG '15 [24] Ans: 4
5. JAN '18 [14] Ans: 1
6. JUN '18 [24] Ans: 2
7. JAN '19 [24] Ans: 4
8. JUN '19 [7] Ans: 2
9. AUG '19 [10] Ans: 1
10. JAN '20 [8] Ans: 1
11. JUN '22 [23] Ans: 4
12. AUG '22 [12] Ans: 3
13. JAN '16 [31]
    $\ell : y = 3x - 4; m : y = 3x - 8$
14. JUN '17 [31]
    The center of dilation is on the original line, so the line does not change. Line p is $3x + 4y = 20$.
15. AUG '18 [30]
    No, the line passes through the center of dilation, so the dilated line is not distinct. To show the given lines are distinct:
    $4x + 3y = 24$
    $3y = -4x + 24$
    $y = -\frac{4}{3}x + 8$
    This has a different y-intercept than $y = -\frac{4}{3}x + 16$.

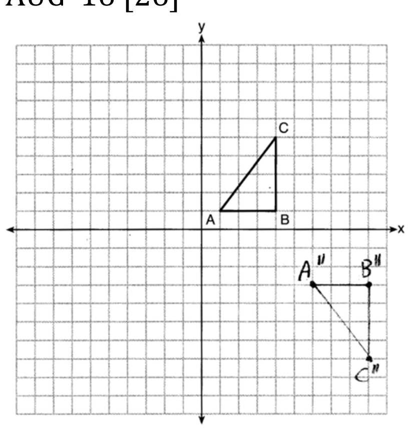
Chapter 6. Transformation Proofs

6.1 Properties of Transformations

1. AUG '15 [13] Ans: 2
2. JAN '16 [5] Ans: 3
3. JUN '16 [4] Ans: 1
4. AUG '16 [2] Ans: 2
5. JAN '18 [4] Ans: 4
6. JAN '18 [8] Ans: 4
7. JUN '18 [1] Ans: 1
8. JAN '19 [2] Ans: 4
9. JUN '22 [10] Ans: 3

6.2 Sequences of Transformations

1. JUN '15 [4] Ans: 4
2. AUG '15 [7] Ans: 1
3. JAN '16 [8] Ans: 1
4. JUN '16 [8] Ans: 4
5. JAN '17 [10] Ans: 3
6. JUN '17 [1] Ans: 2
7. JUN '18 [3] Ans: 4
8. AUG '18 [4] Ans: 1
9. JAN '19 [3] Ans: 3
10. JUN '19 [1] Ans: 4
11. AUG '19 [9] Ans: 2
12. JAN '20 [17] Ans: 2
13. JAN '20 [22] Ans: 1
14. JUN '22 [18] Ans: 3
15. AUG '22 [20] Ans: 2
16. JUN '16 [25]
    translation 6 units right and reflection over x-axis
17. AUG '16 [26]



18. JAN '17 [26]
    $T_{0,-2}$ and r_{y-axis}
19. JUN '17 [30]
    Rotate $\triangle ABC$ about point C until $\overline{DF} \parallel \overline{AC}$.
    Translate $\triangle ABC$ along $\overline{CF}$ so that C maps onto F.
20. AUG '17 [27]
    R_{180° about $\left(-\frac{1}{2}, \frac{1}{2}\right)$
21. JUN '18 [27]
    Reflection over the y-axis followed by a translation up 5.
22. AUG '18 [28]
    rotation 180° about $(0,-1)$;
    or rotation 180° about the origin, translation 2 units down;
    or reflection over x-axis, translation 2 units down, reflection over y-axis
23. JAN '19 [28]
    reflection over line: $r_{y=x+4}$;
    or rotation R_{90° around $(-5,-1)$
    followed by reflection $r_{x=-1}$;
    or rotation R_{90° around $(-5,2)$
    followed by $T_{3,-1}$ and r_{x-axis}

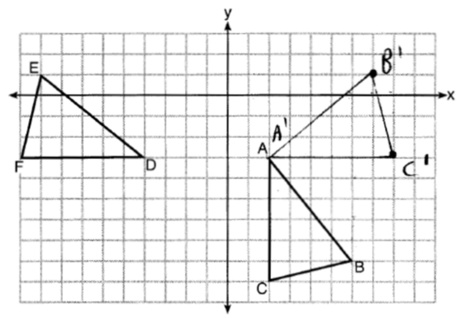
24. JUN ’19 [29]
R_{90° around origin; or $T_{2,-6}$ followed by R_{90° around $(-2,-4)$.

25. AUG ’19 [27]
reflection $r_{y=2}$ and reflection r_{y-axis}

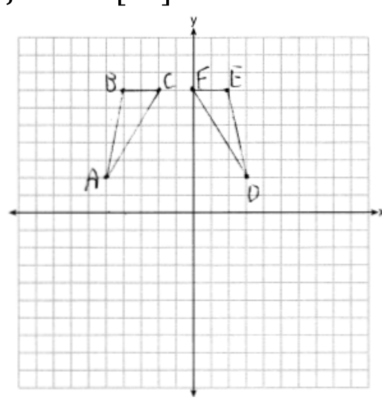
26. AUG ’22 [25]
r_{y-axis} and $T_{0,5}$

6.3 Transformations and Congruence

1. JUN '15 [2] Ans: 4
2. AUG '15 [2] Ans: 3
3. JUN '16 [16] Ans: 3
4. JAN ’17 [6] Ans: 4
5. AUG ’17 [2] Ans: 4
6. AUG ’22 [3] Ans: 3
7. FALL '14 [4]
Translate $\triangle ABC$ such that point C maps onto point F, then reflect over $\overline{DF}$; or reflect $\triangle ABC$ over the $\perp$ bisector of $\overline{EB}$.
8. JUN '15 [30]
Reflections are rigid motions that preserve congruency.
9. AUG '15 [30]
$\triangle XYZ$ is the image of $\triangle ABC$ after a rotation of 180° around the origin. Rotations are rigid motions that preserve congruency.
10. AUG '15 [34]
Translations preserve distance, so if point D is mapped onto point A, then point F would map onto point C.
$\triangle DEF \cong \triangle ABC$ since $\triangle DEF$ can be mapped onto $\triangle ABC$ by a sequence of rigid motions.
11. JAN '16 [28]
Yes. The sequence of transformations consists of a reflection r_{y-axis} and a translation $T_{0,-3}$, which are rigid motions which preserve congruency.
12. AUG ’16 [33]



Mapping $C(2,-9)$ to $C'(8,-3)$ is a 90° rotation about A. This would map $B(6,-8)$ to $B'(7,1)$.
$\triangle DEF \cong \triangle A'B'C'$ because $\triangle DEF$ is a reflection of $\triangle A'B'C'$ over $x=-1$ and reflections preserve congruency.
13. JUN ’17 [32]



Reflection $r_{x=-1}$. The $\triangle$s are $\cong$ because reflections are rigid motions that preserve distance.

14. JAN ’18 [30]
$AB = \sqrt{3^2 + 8^2} = \sqrt{73}$ and $RS = \sqrt{3^2 + 7^2} = \sqrt{58}$, so $\overline{AB}$ is not ≅ to $\overline{RS}$. Therefore, $\triangle ABC$ is not ≅ to $\triangle RST$. Since they are not ≅, there is no sequence of rigid motions that would map $\triangle ABC$ onto $\triangle RST$.

15. JUN ’18 [25]
Yes, translations are rigid motions that preserve distance and angles.

16. JUN ’19 [25]
No, dilations do not preserve distance, and therefore do not preserve congruence.

17. JUN ’22 [28]
Reflections preserve distance and angles, and therefore congruence.

6.4 Transformations and Similarity

1. AUG ’16 [9] Ans: 4
2. JAN ’17 [2] Ans: 2
3. JUN ’17 [14] Ans: 1
4. AUG ’18 [2] Ans: 1
5. FALL '14 [17]
Circle A can be mapped onto circle B by first translating circle A such that A maps onto B, and then dilating circle A, centered at A, by a scale factor of $\frac{5}{3}$.
Since there exists a sequence of transformations that maps circle A onto circle B, circle A is similar to circle B.

6. FALL '14 [19]
Let $\triangle X'Y'Z'$ be the image of $\triangle XYZ$ after a rotation about point Z such that $\overline{ZX'}$ coincides with $\overline{ZU}$. Since rotations preserve angle measure, $\overline{ZY'}$ coincides with $\overline{ZV}$. Then, dilate $\triangle X'Y'Z'$ by a scale factor of $\frac{ZU}{ZX'}$ with its center at point Z. Since dilations preserve angles, $\overline{X'Y'}$ maps onto $\overline{UV}$.
Therefore, $\triangle XYZ \sim \triangle UVZ$.

7. JUN '16 [34]
A dilation of $\frac{5}{2}$ about the origin.
Dilations preserve similarity.

8. JAN ’18 [32]
Dilation by a scale factor of 3 with its center at point A. Dilations preserves similarity.

Chapter 7. Circles in the Coordinate Plane

7.1 Equation of a Circle

1. JUN '15 [14] Ans: 2
1. AUG '15 [9] Ans: 3
2. JAN '16 [17] Ans: 4
3. JUN '16 [3] Ans: 2
4. JUN '16 [23] Ans: 1
5. AUG '16 [16] Ans: 1
6. JAN '17 [18] Ans: 1
7. JAN '17 [22] Ans: 3
8. JUN '17 [12] Ans: 1
9. JAN '18 [12] Ans: 2
10. JUN '18 [20] Ans: 2
11. AUG '18 [21] Ans: 4
12. JAN '19 [20] Ans: 1
13. JUN '19 [20] Ans: 4
14. AUG '19 [6] Ans: 4
15. JAN '20 [20] Ans: 2
16. AUG '22 [19] Ans: 1
17. AUG '16 [30]
    Yes.
    $(x-1)^2+(y+2)^2=4^2$
    $(3.4-1)^2+(1.2+2)^2=4^2$
    $5.76+10.24=16$ ✓
18. AUG '17 [31]
    $x^2-6x+y^2+8y=56$
    $x^2-6x+9+y^2+8y+16=$
    $56+9+16$
    $(x-3)^2+(y+4)^2=81$
    $(3,-4), r=9$
19. JUN '22 [30]
    $x^2+6x+y^2-6y=63$
    $(x^2+6x+9)+(y^2-6y+9)=$
    $63+9+9$
    $(x+3)^2+(y-3)^2=81$
    $(-3,1), r=9$

7.2 Graph Circles [NG]

There are no Regents exam questions on this topic.

Chapter 8. Foundations of Euclidean Geometry

8.1 Postulates, Theorems and Proofs

There are no Regents exam questions on this topic.

8.2 Parallel Lines and Transversals

1. JUN '15 [17] Ans: 1
2. AUG '16 [1] Ans: 2

Chapter 9. Triangles and Congruence

9.1 Angles of Triangles

1. AUG ’16 [4] Ans: 2
2. JUN ’17 [17] Ans: 4
3. JAN ’18 [9] Ans: 3
4. JAN ’18 [18] Ans: 2
5. JUN ’18 [2] Ans: 3
6. AUG ’18 [1] Ans: 4
7. JAN ’19 [16] Ans: 4
8. JAN ’20 [1] Ans: 3
9. JUN ’22 [15] Ans: 3
10. FALL '14 [10]
    The sum of the measures of the ∠’s of a △ is 180°, so
    $m\angle ABC + m\angle BCA + m\angle CAB = 180°$.
    Each interior ∠ of the △ and its exterior ∠ form a linear pair.
    Linear pairs are supplementary, so
    $m\angle ABC + m\angle FBC = 180°$,
    $m\angle BCA + m\angle DCA - 180°$, and
    $m\angle CAB + m\angle EAB - 180°$.
    By addition, the sum of these linear pairs is 540°. When the ∠ measures of the △ are subtracted from this sum, the result is 360°, the sum of the ext ∠’s of the △.
11. JAN '16 [33]
    (2) Parallel Postulate
    (3) Alt Int ∠’s Thm
    (4) Consecutive adjacent ∠’s on a straight line add to 180°
    (5) Substitution

9.2 Triangle Inequality Theorem

1. JAN ’19 [19] Ans: 3

9.3 Segments in Triangles

There are no Regents exam questions on this topic.

9.4 Isosceles and Equilateral Triangles

1. AUG ’16 [8] Ans: 3
2. AUG ’17 [11] Ans: 4
3. AUG ’19 [5] Ans: 3
4. JAN ’20 [12] Ans: 2
5. JUN ’22 [7] Ans: 4
6. FALL '14 [5]
   In an isosceles △, the bisector of the vertex ∠ is also a median. Therefore, $MO = \frac{1}{2}OP$, so $MO = 8$.

7. FALL '14 [24]
$\triangle XYZ$, $\overline{XY} \cong \overline{ZY}$ and $\overline{YW}$ bisects $\angle XYZ$ (Given)
$\triangle XYZ$ is isosceles (Def of isosceles $\triangle$)
$\overline{YW}$ is an altitude of $\triangle XYZ$
($\angle$ bisector of the vertex of an isosceles $\triangle$ is also an altitude)
$\overline{YW} \perp \overline{XZ}$ (Def of altitude)
$\angle YWZ$ is a right $\angle$ (Def of $\perp$)

8. JUN '15 [32]
Since linear pairs are supplementary, $m\angle GIH = 65°$.
Since $\overline{GH} \cong \overline{IH}$, $m\angle IGH = m\angle GIH = 65°$ and $m\angle GHI = 180 - (65 + 65) = 50°$.
Since $\angle EGB \cong \angle GHI$, the corresponding $\angle$'s formed by the transversal and lines are $\cong$ and $\overline{AB} \parallel \overline{CD}$.

9. JAN '17 [30]
$m\angle DAC = m\angle ECA = 25°$
$m\angle AXC = 180 - 2(25) = 130°$

9.5 Triangle Congruence Methods

1. JUN '15 [24] Ans: 3
2. JAN '17 [3] Ans: 1
3. JUN '17 [9] Ans: 2
4. JAN '18 [1] Ans: 1
5. AUG '18 [10] Ans: 4
6. JUN '19 [8] Ans: 4
7. JUN '19 [14] Ans: 4
8. JUN '22 [16] Ans: 4
9. AUG '17 [30]
Yes, a sequence of rigid motions preserves distance and angle measure, so $\triangle ABC \cong \triangle XYZ$ by ASA.
$\overline{BC} \cong \overline{YZ}$ by CPCTC.
10. JAN '20 [25]
Various answers, such as: $\angle Q \cong \angle M$, $\angle P \cong \angle N$, and $\overline{QP} \cong \overline{MN}$.

9.6 Prove Triangles Congruent

1. FALL '14 [21]
a) $\overline{LA} \cong \overline{DN}$, $\overline{CA} \cong \overline{CN}$, and $\overline{DAC} \perp \overline{LCN}$ (Given)
$\angle LCA$ and $\angle DCN$ are right $\angle$'s (Def of $\perp$)
$\triangle LAC$ and $\triangle DNC$ are right $\triangle$s (Def of a right $\triangle$)
$\triangle LAC \cong \triangle DNC$ (HL)
b) Rotate $\triangle LAC$ counterclockwise 90° about point C such that point L maps onto point D.

2. JUN '17 [33]
(Givens omitted)
$\overline{TX} \cong \overline{XV}$ and $\overline{RX} \cong \overline{XS}$ (def of bisector)
$\angle TXR \cong \angle VXS$ (vertical $\angle$'s)
$\triangle TXR \cong \triangle VXS$ (SAS)
$\angle T \cong \angle V$ (CPCTC)
$\overline{TR} \parallel \overline{SV}$ (alt int $\angle$'s converse)

9.7 <u>Overlapping Triangles</u>

1. AUG '16 [22] Ans: 3
2. AUG '19 [33]
   $\triangle ABE \cong \triangle CBD$ (given)
   $\angle A \cong \angle C$ (CPCTC)
   $\angle AFD \cong \angle CFE$ (vertical ∠'s are ≅)
   $\overline{AB} \cong \overline{CB}, \overline{DB} \cong \overline{EB}$ (CPCTC)
   $\overline{AD} \cong \overline{CE}$ (subtraction)
   $\triangle AFD \cong \triangle CFE$ (AAS)
3. JAN '20 [35]
   (Givens omitted)
   $\overline{BD} \cong \overline{BD}$ (reflexive prop)
   $\triangle ABD \cong \triangle CDB$ (SAS)
   $\angle CBD \cong \angle ADB$ (CPCTC)
   $\overline{BC} \cong \overline{DA}$ (CPCTC)
   $\overline{BC} - \overline{CE} = \overline{DA} - \overline{AF}$, so $\overline{BE} \cong \overline{DF}$
   (subtraction prop)
   $\angle BGE \cong \angle DGF$ (vertical ∠'s are ≅)
   $\triangle EBG \cong \triangle FDG$ (AAS)
   $\overline{FG} \cong \overline{EG}$ (CPCTC)

Chapter 10. Triangles and Similarity

10.1 Properties of Similar Triangles

1. JUN '15 [21] Ans: 4
2. AUG '15 [14] Ans: 4
3. AUG '15 [19] Ans: 2
4. JAN '16 [20] Ans: 4
5. AUG '22 [16] Ans: 2
6. JUN '18 [30]
   Yes, both are 5-12-13 △s by the Pythagorean Thm, so they are ≅ by SSS. All ≅ △s are also similar.

10.2 Triangle Similarity Methods

1. JUN '15 [15] Ans: 3
2. JAN '16 [13] Ans: 1
3. JAN '16 [24] Ans: 3
4. JUN '16 [5] Ans: 3
5. JUN '16 [17] Ans: 1
6. AUG '16 [12] Ans: 3
7. AUG '17 [5] Ans: 4
8. AUG '17 [9] Ans: 4
9. JAN '18 [13] Ans: 3
10. JAN '18 [17] Ans: 4
11. JUN '18 [4] Ans: 3
12. JUN '18 [9] Ans: 4
13. JAN '19 [8] Ans: 1
14. JUN '19 [15] Ans: 2
15. AUG '19 [18] Ans: 3
16. JAN '20 [3] Ans: 2
17. JAN '20 [6] Ans: 3
18. JAN '20 [24] Ans: 4
19. JUN '22 [11] Ans: 4
20. JUN '22 [14] Ans: 2
21. AUG '22 [2] Ans: 2
22. AUG '15 [29]
    $\frac{6}{14} = \frac{9}{21}$; Yes (SAS~)
23. AUG '18 [29]
    △s are similar by AA~.
    The △s share the same ∠ at the stake, so these ∠'s are ≅; the ∠'s at the bases of the two poles are corresponding ∠'s formed by ∥ lines, so they are ≅.
    (The ∠'s formed by the poles with the support wire are also ≅ since they are corresponding ∠'s formed by ∥ lines.)

10.3 Prove Triangles Similar

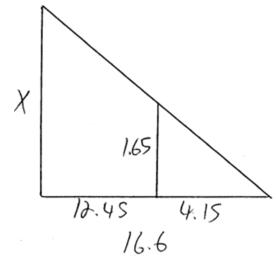
1. JAN '17 [29]
   (Givens omitted)
   $\angle I \cong \angle N,\ \angle G \cong \angle T$ (alt int ∠'s thm)
   $\triangle GIA \sim \triangle TNA$ (AA~)

10.4 Triangle Angle Bisector Theorem

There are no Regents exam questions on this topic.

10.5 Side Splitter Theorem

1. JUN '15 [11] Ans: 3
2. AUG '15 [17] Ans: 4
3. JUN '16 [21] Ans: 2
4. JUN '17 [5] Ans: 4
5. JUN '17 [10] Ans: 2
6. AUG '17 [7] Ans: 4
7. JUN '18 [11] Ans: 2
8. JUN '18 [21] Ans: 4
9. AUG '18 [12] Ans: 2
10. AUG '18 [16] Ans: 3
11. JAN '19 [6] Ans: 2
12. JUN '19 [11] Ans: 1
13. AUG '22 [22] Ans: 4
14. JUN '15 [31]



$\frac{1.65}{4.15} = \frac{x}{16.6}$; $x \approx 6.6$

15. AUG '15 [27]

$\frac{120}{230} = \frac{BC}{315}$; $BC \approx 164$

16. JUN '16 [27]

$\frac{3.75}{5} = \frac{4.5}{6}$; $22.5 = 22.5$ ✓

$\overline{AB} \parallel \overline{CD}$ because $\overline{AB}$ divides the sides proportionately.

10.6 Triangle Midsegment Theorem

1. JAN '17 [4] Ans: 4
2. AUG '17 [16] Ans: 4
3. JUN '19 [23] Ans: 3
4. JAN '20 [9] Ans: 3

Chapter 11. Points of Concurrency

11.1 Incenter and Circumcenter

There are no Regents exam questions on this topic.

11.2 Orthocenter and Centroid

1. JUN ’18 [18] Ans: 1
2. AUG ’19 [4] Ans: 1
3. JAN ’20 [30]
   $CX = 2(CE) = 10;\ CF = \frac{1}{3}(YF) = 7;$
   $XF = \frac{1}{2}(XZ) = 7.5;$
   $P = 10 + 7 + 7.5 = 24.5$

Chapter 12. Right Triangles and Trigonometry

12.1 Congruent Right Triangles

1. JUN '16 [7] Ans: 3

12.2 Equidistance Theorems

1. JUN '16 [19] Ans: 2
2. AUG '16 [11] Ans: 4
3. AUG '18 [22] Ans: 4
4. AUG '18 [32]
   (2) Reflexive; (4) $\angle BDA \cong \angle BDC$;
   (6) CPCTC;
   (7) If points B and D are equidistant from the endpoints of $\overline{AC}$, then B and D are on the ⊥ bisector of $\overline{AC}$.

12.3 Geometric Mean Theorems

1. JAN '16 [22] Ans: 2
2. JUN '16 [13] Ans: 2
3. AUG '16 [10] Ans: 2
4. AUG '17 [18] Ans: 2
5. JAN '18 [23] Ans: 2
6. JUN '18 [23] Ans: 1
7. AUG '18 [7] Ans: 3
8. AUG '18 [20] Ans: 2
9. JAN '19 [10] Ans: 3
10. AUG '19 [16] Ans: 1
11. AUG '19 [20] Ans: 2
12. JAN '20 [16] Ans: 4
13. JUN '22 [13] Ans: 3
14. JUN '15 [34]
    $\sqrt{0.55^2 - 0.25^2} \approx 0.49$
    No, $0.49^2 = 0.25y$
    $0.9604 = y$
    $0.9604 + 0.25 < 1.5$
15. JUN '17 [29]
    If an altitude is drawn to the hypotenuse of a △, it divides the △ into two right △s that are similar to each other and to the original △.
16. JUN '19 [30]
    $\frac{x}{15} = \frac{15}{17};\ 17x = 225;\ x \approx 13.2$
17. AUG '22 [29]
    $\frac{x}{6} = \frac{6}{4x}; 4x^2 = 36; x^2 = 9; x = 3$

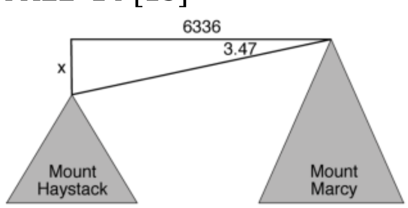
Chapter 13. Trigonometry

13.1 Trigonometric Ratios

1. JUN '16 [15] Ans: 4
2. JAN '17 [14] Ans: 3
3. JAN '19 [17] Ans: 4

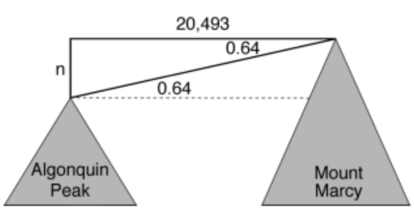
13.2 Use Trigonometry to Find a Side

1. JUN '15 [5] Ans: 3
2. JUN '16 [11] Ans: 4
3. JAN '17 [7] Ans: 2
4. JAN '17 [12] Ans: 3
5. JUN '17 [21] Ans: 4
6. AUG '17 [19] Ans: 1
7. JAN '18 [4] Ans: 1
8. AUG '18 [6] Ans: 4
9. JAN '19 [13] Ans: 2
10. AUG '19 [15] Ans: 2
11. AUG '19 [24] Ans: 1
12. JUN '22 [17] Ans: 1
13. FALL '14 [13]



$\tan 3.47 = \frac{M}{6336}$; $M \approx 384$;

$4960 + 384 = 5344$



$\tan 0.64 = \frac{A}{20493}$; $A \approx 229$;

$5344 - 229 = 5115$

14. FALL '14 [22]

x represents the distance between the lighthouse and the canoe at 5:00; y represents the distance between the lighthouse and the canoe at 5:05.

$\tan 6 = \frac{112-1.5}{x}$; $x \approx 1051.3$

$\tan 55 = \frac{112-1.5}{y}$; $y \approx 77.4$

$\frac{1051.3-77.4}{5} \approx 195$

15. AUG '15 [32]

$\tan 7 = \frac{125}{AC}$; $AC = \frac{125}{\tan 7} \approx 1018.0$

$\tan 16 = \frac{125}{DC}$; $DC = \frac{125}{\tan 16} \approx 435.9$

$AD = AC - DC \approx$

$1018.0 - 435.9 \approx 582$

16. JAN '16 [29]

$\sin 70 = \frac{30}{x}$; $x \approx 32$

17. JAN '16 [36]

$\tan 52.8 = \frac{h}{x}$;

$h = x \tan 52.8 \approx 1.32x$;

$\tan 34.9 = \frac{h}{x+8}$;

$h = (x+8) \tan 34.9 \approx 0.70(x+8)$;

$1.32x = 0.7(x+8)$; $x \approx 9.0$

$\tan 52.8 \approx \frac{h}{9}$; $h \approx 9 \tan 52.8 \approx 11.86$

$11.86 + 1.7 \approx 13.6$

18. AUG '16 [31]

$\sin 75 = \frac{15}{x}$; $x \approx 15.5$

19. JUN ’17 [36]

$\tan 15 = \frac{6250}{x}$; $x \approx 23{,}325.3$

$\tan 52 = \frac{6250}{y}$; $y \approx 4{,}883.0$

$23{,}325.3 - 4{,}883.0 = 18{,}442.3$

Plane traveled 18,442 ft. in 1 min.

$\frac{18442\ \cancel{ft}}{1\ \cancel{min}} \cdot \frac{1\ mile}{5280\ \cancel{ft}} \cdot \frac{60\ \cancel{min}}{1\ hr} \approx 210\ mph$

20. JAN ’18 [34]

$\cos 54 = \frac{4.5}{HI}$; $HI \approx 7.7$ mi

$\tan 54 = \frac{IM}{4.5}$; $IM \approx 6.2$ mi

21. JUN ’18 [33]

$\tan 72° = \frac{ST}{400}$; $ST \approx 1231.07$

$\sin 55° = \frac{ST}{CT} \approx \frac{1231.07}{CT}$; $CT \approx 1503$

22. AUG ’18 [33]

$m\angle AGH = 36$

$\tan 36 = \frac{HA}{10}$; $HA \approx 7.2654$

$HA = FG = DE \approx 7.3$

$AG = \sqrt{(HA)^2 + (HG)^2} =$

$\sqrt{7.2654^2 + 10^2} \approx 12.3607$

$AC = 3 \times 12.3607 \approx 37$

23. JAN ’19 [34]

$\sin 4.76° = \frac{6\cdot 3}{x}$;

$x \approx 216.914$ in. ≈ 18.1 ft.

$\tan 4.76° = \frac{18}{y}$; $y \approx 216.166$ in.

$d = 216.166 - 16 =$

200.166 in. ≈ 16.7 ft.

24. JUN ’19 [27]

$\cos 68 = \frac{10}{x}$; $x \approx 27$

25. JUN ’19 [34]

$\tan 30 = \frac{y}{440}$; $y \approx 254$

$\tan 38.8 = \frac{h}{440}$; $h \approx 353.8$

$353.8 - 254 \approx 100$

26. JAN ’20 [26]

$\sin 38° = \frac{24.5}{x}$; $x \approx 40$ inches

27. JAN ’20 [33]

$\tan 56° = \frac{x}{1.3}$; $x \approx 1.927$;

$x + 1.5 \approx 3.427$;

$(3.427)^2 + (1.3)^2 = c^2$; $c \approx 3.7$ m

28. JUN ’22 [25]

$\sin 86.03 = \frac{183.27}{x}$

$x \approx 183.71$

29. AUG ’22 [28]

$5 - 1.2 = 3.8$

$\cos 14 = \frac{3.8}{x}$

$x \approx 3.92$

30. AUG ’22 [32]

$\tan 22.2 = \frac{50}{x}$; $x \approx 122.52$

$\tan 13.3 = \frac{y}{122.52}$; $y \approx 28.96$

$50 - 28.96 \approx 21$ meters

13.3 Use Trigonometry to Find an Angle

1. FALL '14 [1] Ans: 1
2. JAN '16 [16] Ans: 3
3. JUN ’17 [13] Ans: 1
4. AUG ’17 [15] Ans: 1
5. JUN ’18 [6] Ans: 2
6. AUG ’18 [9] Ans: 1
7. JUN ’19 [22] Ans: 4
8. JAN ’20 [7] Ans: 1
9. AUG ’22 [7] Ans: 4
10. JUN '15 [28]

    $\sin x = \frac{4.5}{11.75}$; $x \approx 23°$

11. JUN '16 [30]

    $\tan x = \frac{10}{4}$; $x \approx 68°$

12. AUG ’16 [34]

$\tan x = \frac{12}{75}; x \approx 9.09$

$\tan y = \frac{72}{75}; y \approx 43.83; y - x \approx 34.7°$

13. JAN ’18 [31]

$\cos x = \frac{6}{18}; x \approx 71°$

14. AUG ’19 [26]

$\sin x = \frac{5}{25}; x \approx 11.5°$

15. JUN ’22 [32]

$\tan x = \frac{0.41}{3.74}; x \approx 6.26$

$\tan y = \frac{1.58}{3.74}; y \approx 22.90; y - x \approx 16.6°$

13.4 Special Triangles

1. JAN ’17 [9] Ans: 2

13.5 Cofunctions

1. JUN '15 [12] Ans: 4
2. AUG '15 [4] Ans: 1
3. JAN '16 [9] Ans: 4
4. AUG ’16 [6] Ans: 1
5. JUN ’17 [3] Ans: 3
6. AUG ’17 [21] Ans: 4
7. JUN ’18 [8] Ans: 1
8. AUG ’18 [24] Ans: 2
9. JAN ’19 [22] Ans: 1
10. JUN ’19 [9] Ans: 2
11. AUG ’19 [19] Ans: 1
12. JAN ’20 [21] Ans: 3
13. JAN ’20 [23] Ans: 2
14. JUN ’22 [6] Ans: 3
15. AUG ’22 [10] Ans: 4
16. FALL '14 [7]

    $2x + 0.1 = 4x - 0.7;\ x = 0.4$

    A and B are complementary ∠’s, and cofunctions of complementary ∠’s are equal.

17. FALL '14 [20]

    The acute ∠’s in a right △ are always complementary. The sine of any acute ∠ is equal to the cosine of its complement.

18. JUN '16 [28]

    $R = 90 - 73 = 17°$

    Cofunctions of complementary ∠’s are equal.

19. JAN ’17 [27]

    Yes, because 28° and 62° ∠’s are complementary. The sine of an ∠ equals the cosine of its complement.

20. JAN ’18 [27]

    Since ∠’s A and B are complementary and sine and cosine are cofunctions, $\sin A = \cos B$. Therefore, when $\sin A$ increases, $\cos B$ increases.

13.6 SAS Sine Formula for Area of a Triangle [NG]

There are no Regents exam questions on this topic.

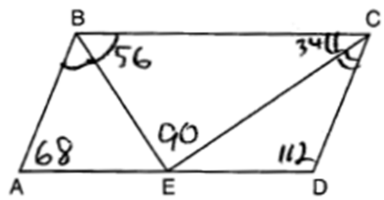
Chapter 14. Quadrilaterals

14.1 Angles of Polygons

There are no Regents exam questions on this topic.

14.2 Properties of Quadrilaterals

1. AUG '15 [8] Ans: 3
2. JAN '16 [3] Ans: 3
3. AUG '16 [24] Ans: 1
4. AUG '17 [8] Ans: 4
5. JAN '18 [2] Ans: 2
6. AUG '18 [13] Ans: 4
7. JAN '19 [7] Ans: 2
8. JAN '19 [12] Ans: 2
9. JUN '19 [17] Ans: 2
10. JUN '19 [21] Ans: 2
11. AUG '19 [7] Ans: 2
12. JAN '20 [15] Ans: 4
13. JUN '22 [21] Ans: 1
14. AUG '22 [15] Ans: 3
15. JUN '15 [26]
    Opp ∠'s in a ▱ are ≅, so m$\angle O = 118°$.
    The int ∠'s of a △ equal 180°.
    $180 - (118 + 22) = 40$.
16. AUG '17 [26]
    The four small △s are 8-15-17 △s.
    $4 \times 17 = 68$
17. AUG '18 [26]
    Ans: 90°

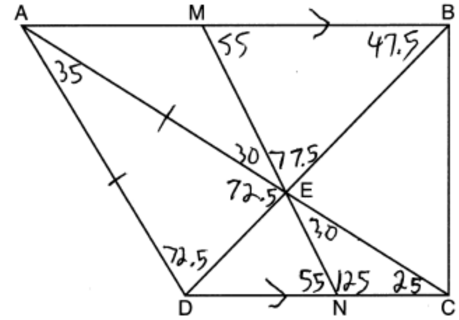


18. JAN '19 [26]
    m$\angle ADC$ = m$\angle B = 118°$
    (▱ → opp ∠'s ≅)
    m$\angle DGF$ = m$\angle ADC = 118°$
    (alt int ∠'s of ∥ lines $\overline{FG}$ and $\overline{EDC}$)
    m$\angle GFH$ = m$\angle AHC$ − m$\angle DGF$ =
    $138° - 118° = 20°$
    ($\angle AHC$ is an ext ∠ of △ FGH)
19. AUG '19 [25]
    m$\angle D = 46°$ (∠'s of a △ add to 180°)
    m$\angle B = 46°$ (▱ → opp ∠'s ≅)

14.3 Trapezoids

1. AUG '17 [35]
   (Givens omitted)
   $\overline{AD} \cong \overline{BC}$ (isos trap → ≅ legs)
   $\angle DEA$ and $\angle CEB$ are right ∠'s (def of ⊥)
   $\angle DEA \cong \angle CEB$ (right ∠'s are ≅)
   $\angle CDA \cong \angle DCB$ (isos trap → ≅ base ∠'s)
   $\angle CDA - \angle CDE \cong \angle DCB - \angle DCE$
   (subtraction)
   $\angle ADE \cong \angle BCE$ (substitution)
   $\triangle ADE \cong \triangle BCE$ (AAS)
   $\overline{EA} \cong \overline{EB}$ (CPCTC)
   $\triangle AEB$ is isosceles (def of isosceles)

2. AUG '22 [30]



   m$\angle ABD = 47.5°$

14.4 Use Quadrilateral Properties in Proofs

1. AUG '22 [17] Ans: 3
2. JUN '15 [33]
   Quad $ABCD$ is a ▱ with diagonals $\overline{AC}$ and $\overline{BD}$ intersecting at E (Given)
   $\overline{AD} \cong \overline{BC}$ (▱ → opp sides ≅)
   $\angle AED \cong \angle CEB$ (Vertical ∠'s are ≅)
   $\overline{BC} \parallel \overline{DA}$ (▱ → opp sides ∥)
   $\angle DBC \cong \angle BDA$ (alt int ∠'s thm)
   $\triangle AED \cong \triangle CEB$ (AAS)
   180° rotation of $\triangle AED$ around point E.
3. AUG '15 [28]
   (Givens omitted)
   $\overline{DC} \parallel \overline{AB}$; $\overline{DA} \parallel \overline{CB}$ (▱ → opp sides ∥)
   $\angle ACD \cong \angle CAB$ (alt int ∠'s thm)
4. JUN '16 [33]
   (Givens omitted)
   $\angle DFE \cong \angle BFG$ (vertical ∠'s are ≅)
   $\overline{AD} \parallel \overline{CB}$ (▱ → opp sides ∥)
   $\angle EDF \cong \angle GBF$ (alt int ∠'s thm)
   $\triangle DEF \sim \triangle BGF$ (AA~)
5. JAN '18 [25]
   (Givens omitted)
   $\overline{AB} \cong \overline{CD}, \overline{AD} \cong \overline{BC}$ (▱ → opp sides ≅)
   $\overline{AC} \cong \overline{AC}$ (Reflexive prop)
   $\triangle ABC \cong \triangle CDA$ (SSS)
6. JUN '22 [33]
   (Givens omitted)
   $\overline{RS} \cong \overline{PQ}$ (▱ → opp sides ≅)
   $\angle P \cong \angle R$ (▱ → opp ∠'s ≅)
   $\angle RUS$ and $\angle PTQ$ are right ∠'s (def of ⊥)
   $\angle RUS \cong \angle PTQ$ (all right ∠'s are ≅)
   $\triangle RUS \cong \triangle PTQ$ (AAS)
   $\overline{PT} \cong \overline{RU}$ (CPCTC)

14.5 Prove Types of Quadrilaterals

1. JUN '15 [13] Ans: 4
2. AUG '15 [1] Ans: 2
3. JUN '16 [9] Ans: 1
4. AUG '16 [7] Ans: 3
5. JAN '17 [5] Ans: 4
6. JAN '17 [16] Ans: 1
7. JUN '17 [11] Ans: 4
8. JUN '17 [20] Ans: 2
9. AUG '17 [14] Ans: 3
10. JAN '18 [19] Ans: 4
11. JUN '18 [13] Ans: 4
12. JUN '19 [12] Ans: 3
13. JUN '19 [24] Ans: 3
14. AUG '19 [13] Ans: 3
15. JAN '20 [4] Ans: 1
16. JUN '22 [9] Ans: 3
17. AUG '22 [4] Ans: 2
18. AUG '15 [35]
    (Givens omitted)
    $\angle BEC$ and $\angle DFC$ are right ∠'s (def of ⊥)
    $\angle BEC \cong \angle DFC$ (right ∠'s are ≅)
    $\angle FCD \cong \angle BCE$ (reflexive prop)
    $\triangle BEC \cong \triangle DFC$ (ASA)
    $\overline{BC} \cong \overline{CD}$ (CPCTC)
    $ABCD$ is a rhombus (▱ with consecutive ≅ sides → rhombus)
19. JAN '16 [35]
    (Givens omitted)
    $\overline{AN} \cong \overline{RD}, \overline{AR} \cong \overline{DN}$ (▱ → opp sides ≅)
    $\frac{1}{2}AR = \frac{1}{2}DN$ (division prop)
    $RE = AE = \frac{1}{2}AR, NW = WD = \frac{1}{2}DN$
    (def of bisector)
    $\overline{RE} \cong \overline{NW}$ and $\overline{AE} \cong \overline{WD}$ (substitution)
    $\angle R \cong \angle N$ (▱ → opp ∠'s ≅)
    $\triangle ANW \cong \triangle DRE$ (SAS)
    $\overline{AER} \parallel \overline{NWD}$ (▱ →opp sides ∥)
    $AWDE$ is a ▱ (quad with pair of opp sides ≅ and ∥ → ▱)
20. JUN '16 [35]
    (Givens omitted)
    quad $ABCD$ is a ▱ (diagonals of a quad bisect each other → ▱)
    quad $ABCD$ is a rhombus (diagonal of a ▱ bisects its ∠ → rhombus)
    $\overline{AD} \cong \overline{DC}$ (rhombus → ≅ sides)
    $\triangle ACD$ is isosceles △ (def of isosceles)
    $\overline{AE} \perp \overline{BE}$ (diagonals of a rhombus are ⊥)
    $\angle BEA$ is a right ∠ (def of ⊥)
    $\triangle AEB$ is a right △ (def of right △)
21. JAN '17 [35]
    (Givens omitted)
    $\angle AED$ and $\angle CFB$ are right ∠'s (def of ⊥)
    $\angle AED \cong \angle CFB$ (right ∠'s are ≅)
    $ABCD$ is a ▱ (quad with pair of opp sides ≅ and ∥ → ▱)
    $\overline{AD} \parallel \overline{BC}$ (▱ →opp sides ∥)
    $\angle DAE \cong \angle BCF$ (alt int ∠'s thm)
    $\overline{DA} \cong \overline{BC}$ (▱ →opp sides ≅)
    $\triangle ADE \cong \triangle CBF$ (AAS)
    $\overline{AE} \cong \overline{CF}$ (CPCTC)

22. JUN ’18 [35]
(Givens omitted)
$\overline{BC} \parallel \overline{AD}$ (▱ →opp sides ∥)
$\overline{BE} \parallel \overline{FD}$ (parts of ∥ lines are ∥)
$\overline{BF} \parallel \overline{DE}$ (two lines ⊥ to same line are ∥)
$BEDF$ is a ▱ (quad with both pairs of opp sides ∥ → ▱)
$\angle DEB$ is a right ∠ (def of ⊥)
$BEDF$ is a ▭ (▱ with a right ∠ → ▭)

23. JAN ’19 [35]
(Givens omitted)
$\overline{HF} \cong \overline{HF}$ (Reflexive prop)
$\overline{HF} + \overline{CF} \cong \overline{HF} + \overline{AH}$, so $\overline{AF} \cong \overline{CH}$ (Addition prop)
$\overline{AE} + \overline{BE} \cong \overline{CG} + \overline{DG}$, so $\overline{AB} \cong \overline{CD}$ (Addition prop)
$ABCD$ is a ▱ (both pairs of opp sides ≅)
$\overline{AB} \parallel \overline{CD}$ (▱ →opp sides ∥)
$\angle BAC \cong \angle DCA$ (alt int ∠’s thm)
$\triangle EAF \cong \triangle GCH$ (SAS)
$\overline{EF} \cong \overline{GH}$ (CPCTC)

24. JUN ’19 [35]
(Givens omitted)
$\angle HEA$ and $\angle TAH$ are right ∠’s (def of ⊥)
$\angle HEA \cong \angle TAH$ (right ∠’s are ≅)
$MATH$ is a ▱ (quad with two pairs of opp sides ≅ → ▱)
$\overline{MA} \parallel \overline{TH}$ (opp sides of ▱ are ∥)
$\angle THA \cong \angle EAH$ (alt int ∠’s thm)
$\triangle HEA \sim \triangle TAH$ (AA~)
$\frac{HA}{TH} = \frac{HE}{TA}$ (CSSTP)
$TA \cdot HA = HE \cdot TH$ (cross prods =)

25. AUG ’22 [35]
(Givens omitted)
$\overline{AD} \parallel \overline{BC}$ (transitive prop)
$ABCD$ is a ▱ (pair of opp sides ∥ and ≅)
$\angle AHE \cong \angle CHF$ (vertical ∠’s are ≅)
$\overline{AB} \parallel \overline{CD}$ (opp sides of a ▱ are ∥)
$\angle BAC \cong \angle DCA$ (alt int ∠’s thm)
$\triangle AHE \sim \triangle CHF$ (AA~)
$\frac{EH}{FH} = \frac{AH}{CH}$ (CSSTP)
$(EH)(CH) = (FH)(AH)$ (cross prods =)

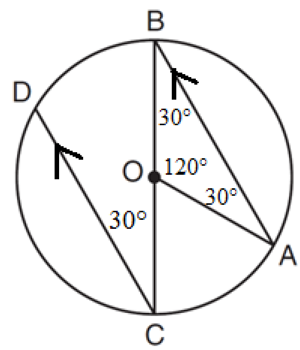
Chapter 15. Circles

15.1 Circumference and Rotation

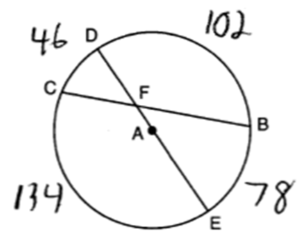
1. JAN '16 [23] Ans: 1

15.2 Arcs and Chords

2. JUN '15 [8] Ans: 1
3. AUG '15 [11] Ans: 2
4. AUG '15 [15] Ans: 3
5. JUN '16 [10] Ans: 2
6. AUG '16 [23] Ans: 1
7. JUN '17 [4] Ans: 4
8. JUN '17 [8] Ans: 2
9. AUG '17 [4] Ans: 1
10. JAN '18 [16] Ans: 4
11. JAN '18 [21] Ans: 4
12. JUN '18 [17] Ans: 3
13. JAN '19 [5] Ans: 4
14. JUN '19 [13] Ans: 3
15. AUG '19 [22] Ans: 4
16. AUG '22 [18] Ans: 4
17. AUG '22 [24] Ans: 4
18. JAN '16 [26]
    120°
    $\angle B \cong \angle C$ (alt int ∠'s)
    $\angle A \cong \angle B$ (base ∠'s of isosceles △ formed by two radii)



19. AUG '18 [27]
    118°



$\frac{134+102}{2} = 118$

20. JUN '22 [26]
    $2x + 3x + 5x + 5x = 360$, so $15x = 360$, or $x = 24$.
    $\text{m}\,\widehat{CD} + \text{m}\,\widehat{DA} = 2x + 3x = 5(24) = 120$
    $m\angle B = \frac{1}{2}(120) = 60$

15.3 Tangents

1. JUN '15 [20] Ans: 1
2. AUG '15 [12] Ans: 3
3. JAN '16 [21] Ans: 3
4. AUG '18 [14] Ans: 2
5. AUG '22 [23] Ans: 2
6. AUG '16 [25]
   $\frac{3}{8} \cdot 56 = 21$

15.4 Secants

1. JAN '17 [15] Ans: 2
2. AUG '17 [12] Ans: 2
3. JUN '19 [18] Ans: 1
4. JUN '22 [19] Ans: 1
5. JAN '17 [28]
   $\frac{152-56}{2} = 48°$
6. JUN '18 [28]
   $10 \cdot 6 = 15x$
   $x = 4$
7. JAN '19 [27]
   $\text{m}\angle RPS = \frac{m\widehat{RS} - m\widehat{WT}}{2}$
   $35 = \frac{121-x}{2}$
   $-x = 70 - 121$
   $x = 51°$
8. AUG '19 [30]
   $\frac{124-56}{2} = 34$
9. JAN '20 [28]
   $(DA)^2 = (AB)(AC);\ (DA)^2 = (8)(12.5);$
   $(DA)^2 = 100;\ DA = 10$

15.5 Circle Proofs

1. FALL '14 [26]
   (Givens omitted)
   Chords $\overline{BC}$ and $\overline{BD}$ are drawn (auxiliary lines)
   $\angle A \cong \angle A$, $\widehat{BC} \cong \widehat{BC}$ (Reflexive prop)
   $\text{m}\angle BDC = \frac{1}{2}\text{m}\,\widehat{BC}$ (an inscribed $\angle$ is half the measure of its intercepted arc)
   $\text{m}\angle CBA = \frac{1}{2}\text{m}\,\widehat{BC}$ (an $\angle$ formed by a tangent and chord measures half the intercepted arc)
   $\text{m}\angle BDC = \text{m}\angle CBA$ (substitution)
   $\angle BDC \cong \angle CBA$ (def of $\cong$)
   $\triangle ABC \sim \triangle ADB$ (AA~)
   $\frac{AB}{AC} = \frac{AD}{AB}$ (Side Proportionality)
   $AC \cdot AD = AB^2$ (cross products =)
2. AUG '16 [35]
   (Givens omitted)
   Chords $\overline{CB}$ and $\overline{AD}$ are drawn (auxiliary lines)
   $\angle CEB \cong \angle AED$ (vertical $\angle$'s)
   $\angle C \cong \angle A$ (inscribed $\angle$'s that intercept the same arc are $\cong$)
   $\triangle BCE \sim \triangle DAE$ (AA~)
   $\frac{AE}{CE} = \frac{ED}{EB}$ (Side Proportionality)
   $AE \cdot EB = CE \cdot ED$ (cross products =)

3. AUG ’17 [33]
(Givens omitted)
$\angle B$ is a right $\angle$
($\angle$ inscribed in semi-circle is a right $\angle$)
$\overleftrightarrow{EC} \perp \overleftrightarrow{OC}$ (radius drawn to a point of tangency is $\perp$ to the tangent)
$\angle ECA$ is a right $\angle$ (def of $\perp$)
$\angle B \cong \angle ECA$ (right $\angle$’s are $\cong$)
$\angle BCA \cong \angle CAE$ (alt int $\angle$’s thm)
$\triangle ABC \sim \triangle ECA$ (AA~)
$\frac{BC}{CA} = \frac{AB}{EC}$ (CSSTP)

15.6 Arc Lengths and Sectors

1. JUN '15 [23] Ans: 2
2. AUG '15 [18] Ans: 3
3. JAN '16 [12] Ans: 3
4. JUN '16 [24] Ans: 3
5. AUG ’16 [19] Ans: 2
6. JAN ’17 [21] Ans: 4
7. JAN ’18 [24] Ans: 3
8. JUN ’18 [22] Ans: 4
9. AUG ’18 [18] Ans: 2
10. JAN ’19 [14] Ans: 2
11. AUG ’19 [12] Ans: 4
12. JAN ’20 [13] Ans: 3
13. JUN ’22 [24] Ans: 4
14. FALL '14 [23]
$m\angle BOD = \frac{180-20}{2} = 80°$
$\frac{\theta}{360°} = \frac{S}{\pi r^2};\ \frac{80}{360} = \frac{S}{36\pi};\ S = 8\pi$
15. JUN '15 [29]
$\frac{\theta}{360°} = \frac{S}{\pi r^2};\ \frac{\theta}{360} = \frac{12\pi}{36\pi};\ \theta = 120°$
16. JUN ’17 [26]
$\frac{\theta}{360°} = \frac{S}{\pi r^2};\ \frac{40}{360} = \frac{S}{20.25\pi};\ S = 2.25\pi$
17. JAN ’18 [28]
$S = 625\pi - 500\pi = 125\pi$
$\frac{\theta}{360°} = \frac{S}{\pi r^2};\ \frac{\theta}{360} = \frac{125\pi}{625\pi};\ \theta = \frac{1}{5} \cdot 360 = 72°$
18. JUN ’19 [28]
$\frac{\theta}{360°} = \frac{S}{\pi r^2};\ \frac{72}{360} = \frac{S}{100\pi};\ S = 20\pi$
19. AUG ’22 [31]
$\frac{\theta}{360°} = \frac{S}{\pi r^2};\ \frac{72}{360} = \frac{S}{16\pi};\ S \approx 10.1$

15.7 Radians [CC]

1. FALL '14 [4] Ans: 3
2. AUG ’17 [23] Ans: 2
3. JUN '16 [29]
$\pi = A \cdot 4$ $\frac{13\pi}{8} = B \cdot 6.5$
$A = \frac{\pi}{4}$ $B = \frac{\pi}{4}$
Yes, both angles are equal.

Chapter 16. Solids

16.1 Volume of a Sphere

1. JAN '16 [14] Ans: 3
2. JUN '19 [10] Ans: 1
3. JUN '17 [28]

$V = \frac{4}{3}\pi r^3$, so $r = \sqrt[3]{\frac{3V}{4\pi}}$.

$\sqrt[3]{\frac{3(294)}{4\pi}} - \sqrt[3]{\frac{3(180)}{4\pi}} \approx 0.6$

4. JUN '18 [31]

$2\pi r = 29.5$

$r = \frac{29.5}{2\pi}$

$V = \frac{4}{3}\pi r^3 = \frac{4}{3}\pi\left(\frac{29.5}{2\pi}\right)^3 \approx 434 \text{ in}^3$

5. JUN '22 [29]

$V = \frac{1}{2}\cdot\frac{4}{3}\pi(2.8)^3 \approx 45.976$

$100 \times 45.976 \approx 4598$

16.2 Volume of a Prism or Cylinder

1. JAN '16 [4] Ans: 2
2. AUG '16 [20] Ans: 4
3. JAN '17 [11] Ans: 2
4. JUN '17 [23] Ans: 3
5. JUN '18 [7] Ans: 1
6. JUN '16 [32]

$\frac{\pi(11.25)^2(33.5)}{231} \approx 57.7$

7. JUN '17 [34]

$V = 20{,}000\, \not{g} \cdot \frac{1\, ft^3}{7.48\, \not{g}} \approx 2673.8\, ft^3$

$V = \pi r^2 h$

$2673.8 = \pi r^2(34.5)$

$r \approx 4.967$

$p \approx 2(4.967) + 1 \approx 10.9$

8. AUG '17 [36]

$\tan 16.5 = \frac{x}{13.5}$

$x \approx 4$; $4.5 + 4 = 8.5$ ft.

$V_1 = 9 \cdot 16 \cdot 4.5 = 648$

$V_2 = 13.5 \cdot 16 \cdot 4.5 = 972$

$V_3 = \frac{1}{2} \cdot 13.5 \cdot 16 \cdot 4 = 432$

$V_4 = 12.5 \cdot 16 \cdot 8.5 = 1700$

$V_1 + V_2 + V_3 + V_4 = 3752 \text{ ft}^3$

$3752 - (35 \cdot 16 \cdot 0.5) = 3472$

$3472 \cdot 7.48 \approx 25{,}971$

$\frac{25{,}971}{10.5} \approx 2473.4$

$\frac{2473.4}{60} \approx 41$ hrs

9. JAN '18 [33]

$V_{hemisphere} = \frac{1}{2}\cdot\frac{4}{3}\pi r^3 =$

$\frac{2}{3}\pi \cdot 4^3 \approx 134.04$

$V_{cylinder} = \pi r^2 h =$

$\pi \cdot 4^2 \cdot (13 - 4) \approx 452.39$

$V \approx 134.04 + 452.39 \approx 586 \text{ m}^3$

10. AUG '18 [31]

$2\left(\frac{36}{12} \times \frac{36}{12} \times \frac{4}{12}\right) \times \$3.25 = \$19.50$

11. JAN '19 [33]
$V_T = 30 \cdot 15 \cdot 3.5 = 1{,}575$ cu. ft.
$1575 \cdot 7.48 = 11{,}781$ gallons
$\$3.95 \cdot 117.81 \approx \$465.35$
$V_N = \pi \cdot 12^2 \cdot 3.5 = 504\pi$ cu. ft.
$504\pi \cdot 7.48 \approx 11{,}843.553$ gallons
$200 per 6000 = $1 per 30 gallons
$11{,}843.553 \div 30 \approx \$394.79$
Theresa paid more.

12. JUN '19 [33]
$r = \frac{6.5}{2} = 3.25;$
$V = \frac{2}{3}\pi(3.25)^2(1) \approx 22$
$22 \times 7.48 \approx 165$

13. AUG '19 [31]
$r = \frac{8.25}{2} = 4.125;$
$V = \pi(4.125)^2(2.5) \approx 134$

14. AUG '19 [34]
Altitude of △ base = $\sqrt{4^2 - 3^2} = \sqrt{7}$
Area of △ base = $\frac{1}{2}(6)(\sqrt{7}) = 3\sqrt{7}$
Area of ▭ base = $(10)(6) = 60$
Volume = $(60 + 3\sqrt{7})(6.5) \approx 442$

15. JAN '20 [34]
$V_{cylinder} = \pi(7)^2(18) \approx 2770.8847$
$V_{prism} = 16x^2$
$16x^2 = 2770.8847;\ x^2 \approx 173.1803;$
$x \approx 13.2$
$\frac{80}{13.2} \approx 6.1$ and $\frac{60}{13.2} \approx 4.5$, so $6 \times 4 = 24$ containers fit

16. JUN '22 [34]
$V = \pi(0.5)^2(4) = \pi$
$10\pi \div \frac{2}{3} \approx 47.12$, so 48 bags are needed

16.3 Volume of a Pyramid or Cone

1.	AUG '15 [21]	Ans: 4
2.	JAN '16 [7]	Ans: 2
3.	JUN '16 [6]	Ans: 4
4.	JAN '17 [24]	Ans: 1
5.	JUN '17 [16]	Ans: 1
6.	JAN '18 [7]	Ans: 3
7.	JAN '18 [22]	Ans: 2
8.	JUN '18 [10]	Ans: 1
9.	AUG '18 [19]	Ans: 2
10.	JAN '19 [9]	Ans: 2
11.	JAN '19 [23]	Ans: 1
12.	JUN '19 [6]	Ans: 2
13.	AUG '19 [21]	Ans: 3
14.	JAN '20 [2]	Ans: 2
15.	JAN '20 [10]	Ans: 1
16.	AUG '22 [8]	Ans: 2

17. JUN '16 [36]
Similar △s are required to model and solve a proportion.
Let x = height of the rest of the cone
$\frac{height\ of\ cone}{radius\ of\ top} = \frac{height\ below\ glass}{radius\ of\ bottom}$
$\frac{x+5}{1.5} = \frac{x}{1}$
$x = 10$
$h = 10 + 5 = 15$
$V_{glass} = V_{cone} - V_{below\ glass}$
$V_{glass} = \frac{1}{3}\pi(1.5)^2(15) - \frac{1}{3}\pi(1)^2(10) \approx 24.9$

18. JAN '17 [34]
$C = 2\pi r$
$31.416 = 2\pi r$
$r = \frac{31.416}{2\pi} \approx 5$
$V = \frac{1}{3}\pi r^2 h = \frac{1}{3}(25)(13)\pi \approx 340$

19. JUN '22 [27]

$r = \frac{1}{2}(10) = 5$

$h^2 + 5^2 = 13^2$, so $h = 12$

$V = \frac{1}{3}\pi(5^2)(12) = 100\pi$

16.4 Density

1. JUN '15 [7] Ans: 3
2. AUG '15 [16] Ans: 1
3. JAN '16 [19] Ans: 2
4. JUN '16 [18] Ans: 2
5. JUN '16 [20] Ans: 1
6. AUG '16 [17] Ans: 2
7. AUG '19 [14] Ans: 2
8. JAN '20 [14] Ans: 1
9. JUN '22 [12] Ans: 1
10. AUG '22 [21] Ans: 1
11. FALL '14 [6]

    $5.1 \cdot 10.2 \cdot 20.3 = 1{,}056.006$ cm^3

    $500 \cdot 1{,}056.006 = 528{,}003$ cm^3

    $528{,}003\ \cancel{cm^3} \cdot \frac{1\ m^3}{100\ \cancel{cm^3}} = 0.528003\ m^3$

    $\frac{1920\ kg}{\cancel{m^3}} \cdot 0.528003\ \cancel{m^3} \approx 1013\ kg$

    No, the weight of the bricks is greater than 900 kg
12. FALL '14 [25]

    $r = 25\ \cancel{cm} \cdot \frac{1\ m}{100\ \cancel{cm}} = 0.25\ m$

    $V = \pi(0.25)^2(10) = 0.625\pi\ m^3$

    $W = 0.625\pi\ \cancel{m^3} \cdot \frac{380\ kg}{\cancel{m^3}} \approx 746.1\ kg$

    $\$4.75 \times 746.1 \approx \$3{,}544$ per tree

    $\frac{\$50{,}000}{\$3{,}544} \approx 14.1$

    Need to sell 15 trees
13. JUN '15 [35]

    $\tan 47° = \frac{x}{8.5}$

    $x \approx 9.115$

    $V_{cone} = \frac{1}{3}\pi(8.5)^2(9.115) \approx 689.6$

    $V_{cylinder} = \pi(8.5)^2(25) \approx 5674.5$

    $V_{hemisphere} = \frac{1}{2} \cdot \frac{4}{3}\pi(8.5)^3 \approx 1286.3$

    $V_{tower} \approx 689.6 + 5674.5 + 1286.3 \approx 7650$ ft^3

    $85\% \cdot 7650\ \cancel{ft^3} \cdot \frac{62.4\ lbs}{\cancel{ft^3}} = 405{,}756\ lbs$

    No, the weight exceeds 400,000 lbs
14. AUG '15 [25]

    $\frac{137.8}{6^3} \approx 0.638\ g/cm^3$; Ash
15. AUG '15 [36]

    $V_{cone} = \frac{1}{3}\pi\left(\frac{3}{2}\right)^2(8) \approx 18.85\ in^3$

    Total $\approx 100 \times 18.85 \approx 1885\ in^3$

    $(0.52 \times 1885) \times \$0.10 = \$98.02$

    $(100 \times \$1.95) - (\$98.02 + \$37.83) = \$59.15$
16. AUG '16 [36]

    $V = \frac{1}{3}\pi\left(\frac{8.3}{2}\right)^2(10.2) + \frac{1}{2} \cdot \frac{4}{3}\pi\left(\frac{8.3}{2}\right)^3$

    $\approx 183.961 + 149.693 \approx 333.65$ cm^3

    $333.65 \times 50 = 16{,}682.7$ cm^3

    $16{,}682.7 \times 0.697 = 11{,}627.8$ g

    $11{,}627.8$ g $= 11.6278$ kg

    $11.6278 \times 3.83 = \$44.53$

17. JAN '17 [36]
$V_{cylinder} =$
$\pi(26.7)^2(750) - \pi(24.2)^2(750) =$
$95{,}437.5\pi\ cm^3$
$95{,}437.5\ \cancel{cm^3} \cdot \frac{2.7\ \cancel{g}}{1\ \cancel{cm^3}} \cdot \frac{1\ \cancel{kg}}{1000\ \cancel{g}} \cdot \frac{\$0.38}{1\ \cancel{kg}} =$
\$307.62
$V_{prism} =$
$(40)^2(750) - (35)^2(750) = 281{,}250$
$281{,}250\ \cancel{cm^3} \cdot \frac{2.7\ \cancel{g}}{1\ \cancel{cm^3}} \cdot \frac{1\ \cancel{kg}}{1000\ \cancel{g}} \cdot \frac{\$0.38}{1\ \cancel{kg}} =$
\$288.56
Prisms cost less.
$307.62 - 288.56 = \$19.06$

18. JAN '18 [29]
$D = \frac{W}{V}$, so $7.95 = \frac{W}{1015}$
$W = (7.95)(1015) = 8{,}069.25$ g
$500 \times 8069.25 = 4{,}034{,}625$ g $=$
4034.625 kg
$4034.625 \times 0.29 \approx \$1{,}170$

19. JUN '18 [34]
$V = \pi r^2 = \pi(10)^2(18) = 1800\pi$
$1800\pi\ \cancel{in^3} \cdot \frac{1\ ft^3}{12^3\ \cancel{in^3}} \approx 1.0417\pi\ ft^3$
$1.0417\pi(95.46)(0.85) \approx 266$ lbs
$266 + 270 = 536$ lbs

20. AUG '18 [34]
Diameter of hollow is $4 - 2(0.5) = 3$.
Radius of outer sphere is 2 and radius of inner sphere is 1.5.
$V = \frac{4}{3}\pi(2^3 - 1.5^3) \approx 19.4$
$19.4 \times 1.308 \times 8 \approx 203$

21. JAN '20 [27]
$V = (8)(3)\left(\frac{1}{12}\right) = 2$
$43 \times 2 = 86$ lbs

22. AUG '22 [34]
$\frac{24}{2.94} \approx 8.16; \frac{12}{2.94} \approx 4.08; \frac{18}{2.94} \approx 6.12$
$8 \times 4 \times 6 = 192$ baseballs
$V = \frac{4}{3}\pi(1.47)^3 \approx 13.306$ cu. in.
$192 \times 13.306 \times 0.025 \approx 64$ lbs

16.5 Lateral Area and Surface Area

1. JUN '15 [19] Ans: 2

16.6 Rotations of Two-Dimensional Objects

1. JUN '15 [1] Ans: 4
2. AUG '15 [3] Ans: 4
3. JUN '16 [1] Ans: 3
4. AUG '16 [3] Ans: 1
5. JUN '17 [18] Ans: 1
6. AUG '17 [13] Ans: 3
7. JAN '18 [10] Ans: 4
8. JUN '18 [16] Ans: 3
9. AUG '18 [3] Ans: 4
10. JAN '19 [11] Ans: 3
11. JUN '19 [3] Ans: 2
12. AUG '19 [11] Ans: 4
13. JUN '22 [8] Ans: 1
14. AUG '22 [26]
$V_{cone} = \frac{1}{3}\pi(8)^2(5) \approx 335.1$

16.7 Cross Sections

1. JUN '15 [6] Ans: 2
2. JAN '16 [1] Ans: 1
3. AUG '16 [13] Ans: 3
4. JAN '17 [23] Ans: 4
5. AUG '17 [1] Ans: 2
6. JAN '18 [5] Ans: 2
7. AUG '18 [5] Ans: 3
8. JAN '20 [19] Ans: 4
9. JUN '22 [2] Ans: 2
10. AUG '22 [11] Ans: 1

16.8 Cavalieri's Principle [CC]

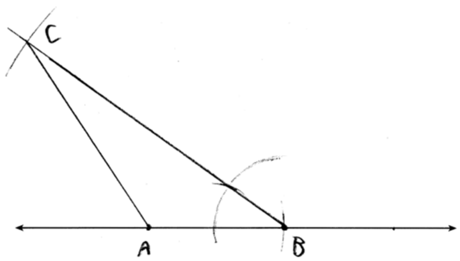
1. FALL '14 [18]
   Each quarter in both stacks has the same base area. Therefore, each corresponding cross-section of the stacks will have the same area. Since the two stacks of quarters have the same height of 23 quarters, the two volumes must be the same.
2. JUN '17 [27]
   Each triangular prism has the same base area. Therefore, each corresponding cross-section of the prisms will have the same area. Since the two prisms have the same height of 14, the two volumes must be the same.
3. AUG '17 [25]
   Yes. The bases of the cylinders have the same area and the cylinders have the same height.

Chapter 17. Constructions

17.1 Copy Segments, Angles, and Triangles

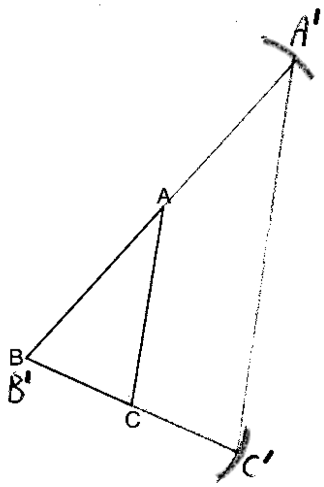
1. JAN '16 [34]

   solutions vary, such as



   SAS

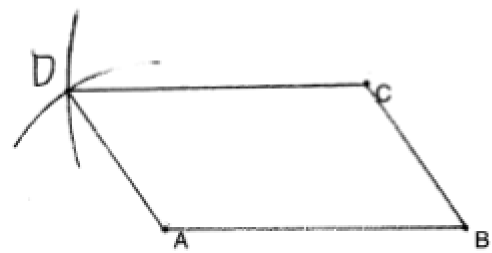
2. AUG '16 [32]



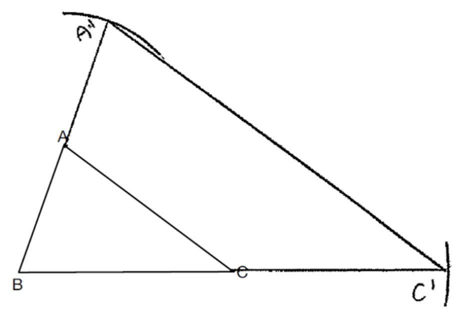
   $A'C'$ is twice AC

3. JAN '19 [29]

   copy length of $\overline{AB}$ from C and length of $\overline{BC}$ from A for point D at intersecting arcs

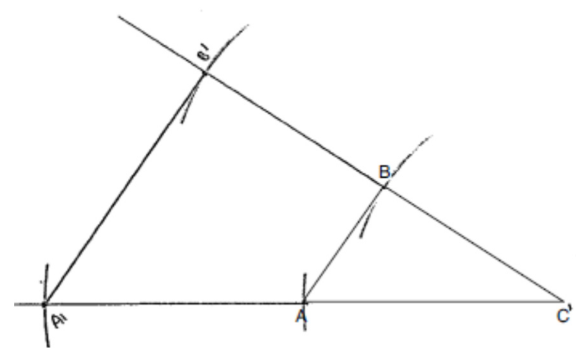


4. AUG '19 [32]



   Yes, because a dilation preserves ∠'s.

5. AUG '22 [27]



17.2 Construct an Equilateral Triangle

There are no Regents exam questions on this topic.

17.3 Construct an Angle Bisector

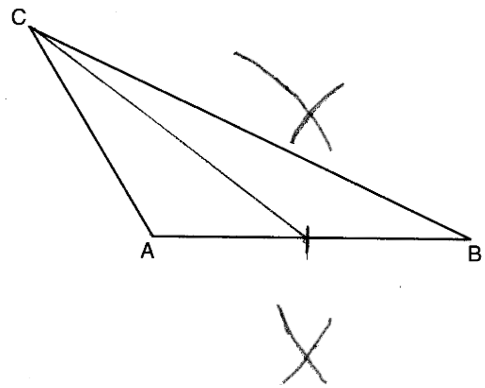
1. AUG '19 [29]

   $\triangle ABC$ is an equilateral $\triangle$, so $m\angle CAB = 60°$;

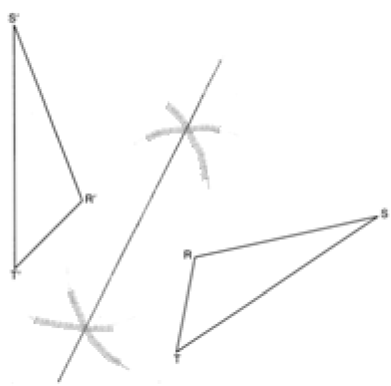
   $\overrightarrow{AD}$ is an $\angle$ bisector, so $m\angle CAD = 30°$.

17.4 Construct a Perpendicular Bisector

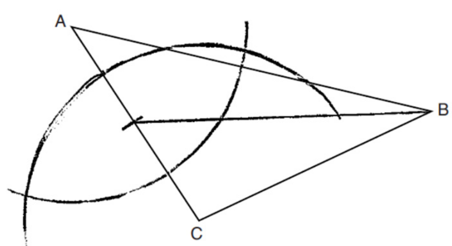
1. AUG '16 [28]



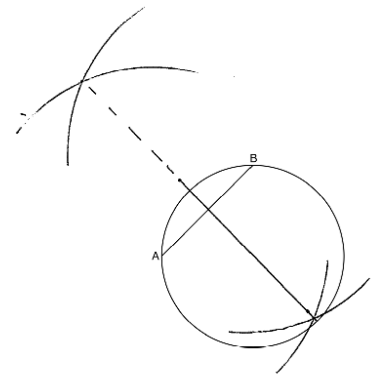
2. JAN '17 [25]



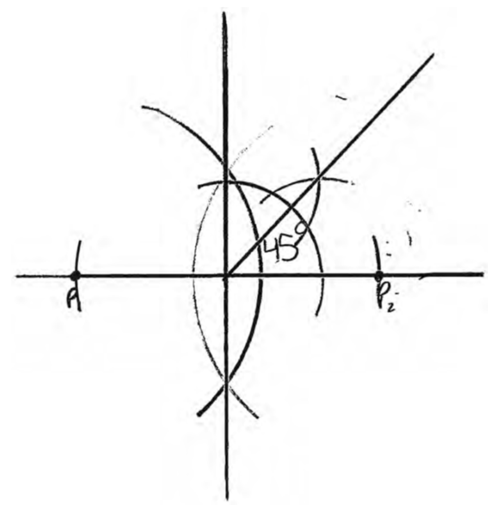
3. JUN '18 [29]



4. AUG '18 [25]



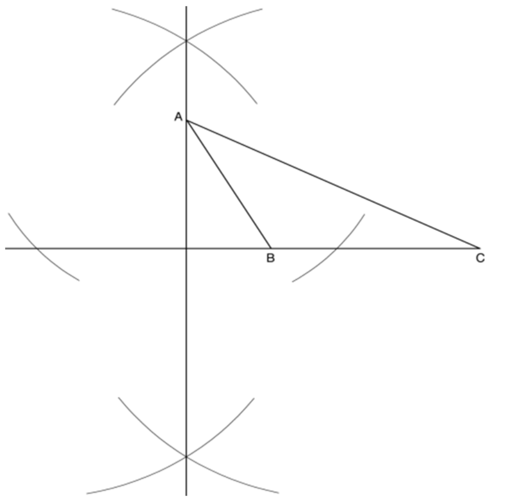
5. JAN '20 [29]



17.5 Construct Lines Through a Point

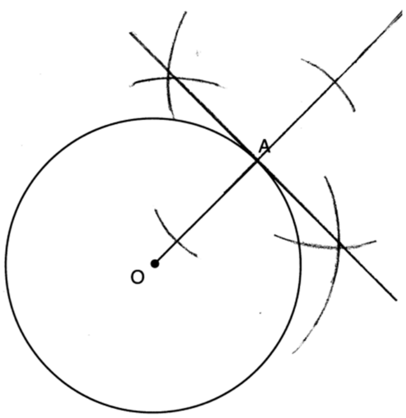
1. FALL '14 [9]

   The altitude is ⊥ to the extended side.

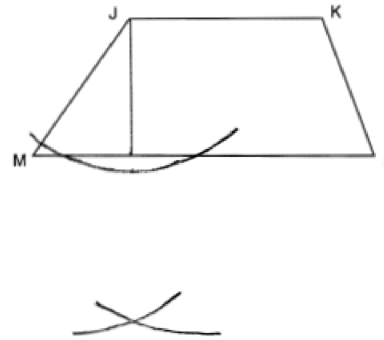


2. JUN '16 [31]

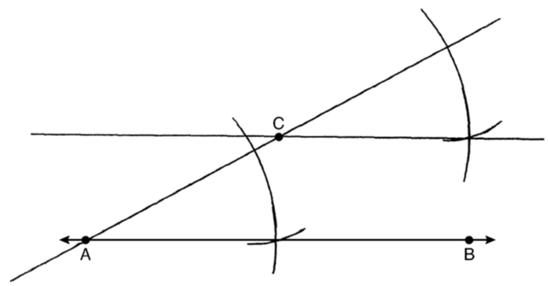
   The tangent is ⊥ to $\overline{OA}$.



3. JUN '17 [25]

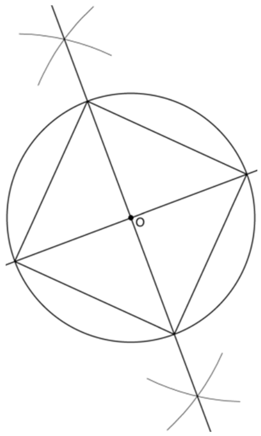


4. JUN '22 [31]



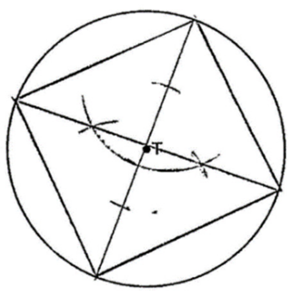
17.6 Construct Inscribed Regular Polygons

1. FALL '14 [12]

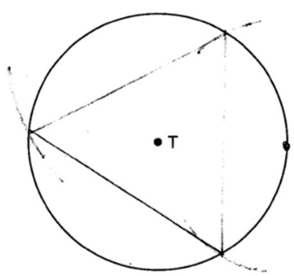


The sides of the square are four ≅ chords in the circle, so they intercept four ≅ arcs. Each arc therefore measures one-fourth of 360°, or 90°. Therefore, an arc intercepted by two adjacent sides measures $2 \times 90° = 180°$.

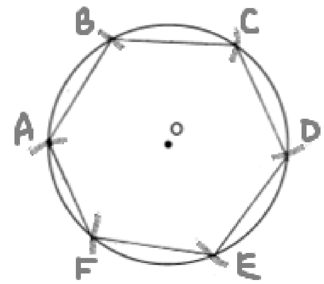
2. JUN '15 [25]



3. AUG '15 [26]

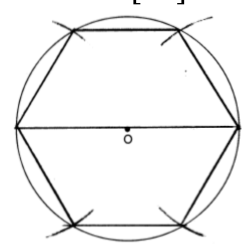


4. JAN '17 [33]

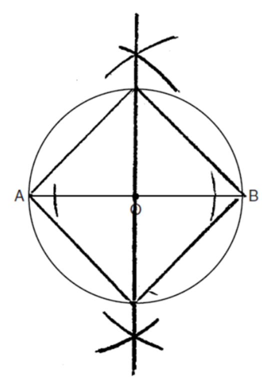


$\overline{COF}$ is a diameter, so $\angle FBC$ is an inscribed ∠ of a semicircle, and is therefore a right ∠. This means $\triangle FBC$ is a right △.

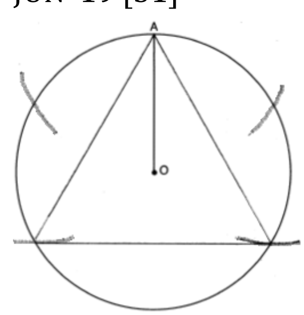
5. AUG '17 [28]



6. JAN '18 [26]



7. JUN '19 [31]



17.7 Construct Points of Concurrency [NG]

There are no Regents exam questions on this topic.

17.8 Construct Circles of Triangles [NG]

There are no Regents exam questions on this topic.