MCR3U: Exam Review F23 - Multiple Choice

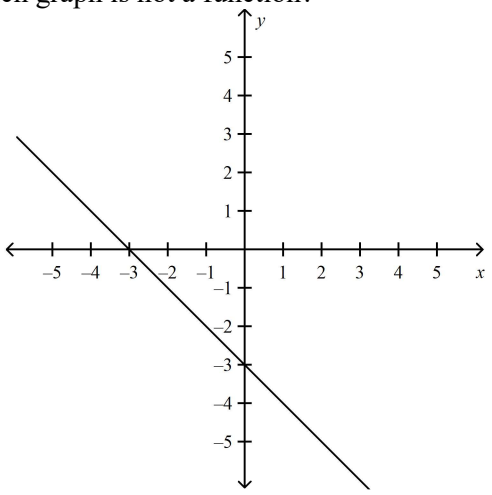
Identify the choice that best completes the statement or answers the question.

____ 1. Which relation is a function?

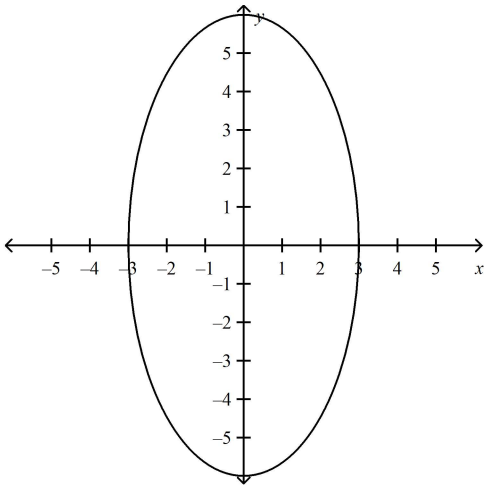
a. {(–3, –2), (–1, 3), (0, –2), (3, 4)}
b. {(0, 1), (3, 2), (5, –3), (0, 2)}
c. {(–7, –7), (–2, 5), (–1, 6), (–2, –5)}
d. {(–4, –7), (–9, 5), (4, –2), (–9, 0)}

____ 2. Which graph is not a function?

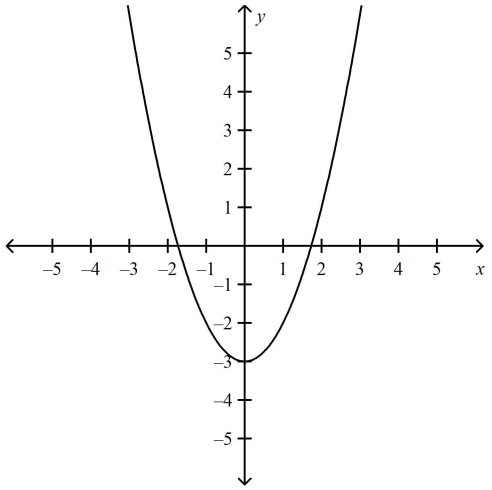
a.



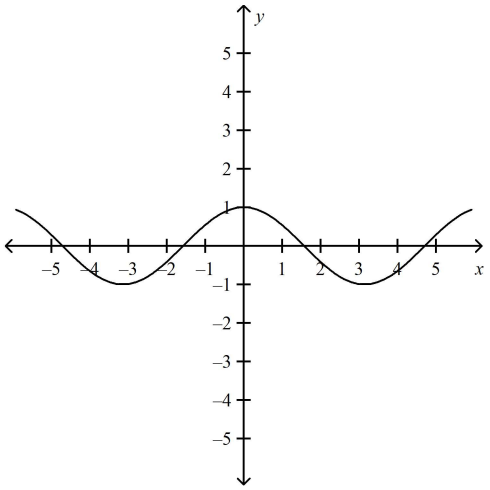
c.



b.



d.



____ 3. Evaluate $f(x) = -4x^2 + 7$ for $f(1) + f(-2)$.

a. –6
b. 3
c. 26
d. 94

____ 4. What are the domain and range of the function $f(x) = \sqrt{x-5}$?

a. Domain = $\{x \in \mathbf{R}\}$
Range = $\{y \in \mathbf{R}\}$

b. Domain = $\{x \in \mathbf{R} \mid x \geq 0\}$
Range = $\{y \in \mathbf{R} \mid y \geq 0\}$

c. Domain = $\{x \in \mathbf{R} \mid x \geq 25\}$
Range = $\{y \in \mathbf{R} \mid y \geq 1\}$

d. Domain = $\{x \in \mathbf{R} \mid x \geq 5\}$
Range = $\{y \in \mathbf{R} \mid y \geq 0\}$

____ 5. What are the domain and range of the relation that contains the points {(–16, –10), (–14, –8), (–11, –3), (–7, 4), (–1, –8)}?

a. Domain = {–16, –14, –11, –10, –8, –7, –3, –1, 4}
Range = {–16, –14, –11, –10, –8, –7, –3, –1, 4}

b. Domain = {–10, –8, –3, 4}
Range = {–16, –14, –11, –7, –1}

c. Domain = {–16, –14, –11, –7, –1}
Range = {–10, –8, –3, 4}

d. Domain = $\{-16 \leq x \leq -1\}$
Range = $\{-10 \leq y \leq 4\}$

____ 6. What are the domain and range of the function $d(x) = 5(x-9)^2 - 32$?

a. Domain = $\{x \in \mathbf{R}\}$
Range = $\{y \in \mathbf{R} \mid y \geq 0\}$

b. Domain = $\{x \in \mathbf{R}\}$
Range = $\{y \in \mathbf{R} \mid y \geq -32\}$

c. Domain = $\{x \in \mathbf{R}\}$
Range = $\{y \in \mathbf{R} \mid y \geq -842\}$

d. Domain = $\{x \in \mathbf{R}\}$
Range = $\{y \in \mathbf{R}\}$

____ 7. What are the domain and range of the function $f(x) = \sqrt{3-x}$?

a. Domain = $\{x \in \mathbf{R}\}$
Range = $\{y \in \mathbf{R}\}$

b. Domain = $\{x \in \mathbf{R} \mid x \leq 3\}$
Range = $\{y \in \mathbf{R} \mid y \geq 0\}$

c. Domain = $\{x \in \mathbf{R} \mid x \geq 0\}$
Range = $\{y \in \mathbf{R} \mid y \geq 1\}$

d. Domain = $\{x \in \mathbf{R} \mid 0 \leq x \leq 3\}$
Range = $\{y \in \mathbf{R} \mid y \geq 0\}$

____ 8. Which of the following is NOT a transformation that can be used to graph the function $f(x) = -6(x-4)^2 + 2$ from the parent function?

a. Vertical translation 2 units up

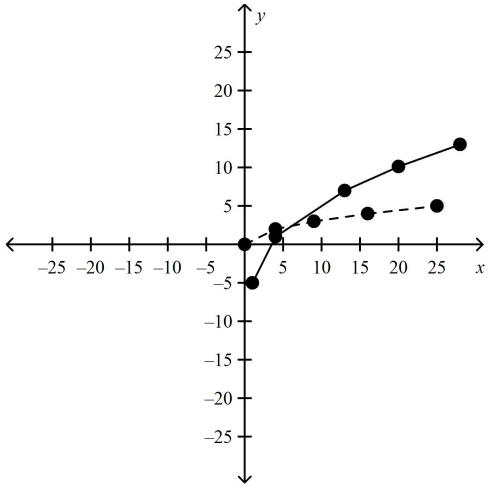
b. Horizontal compression by a factor of $\frac{1}{6}$

c. Reflection in the x-axis

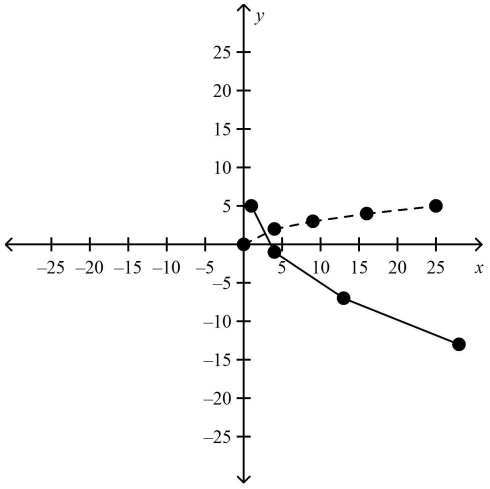
d. Horizontal translation 4 units to the right

____ 9. Which of the following is the graph of the function $f(x) = -2\sqrt{3(x-1)} + 5$? (The parent function is dotted.)

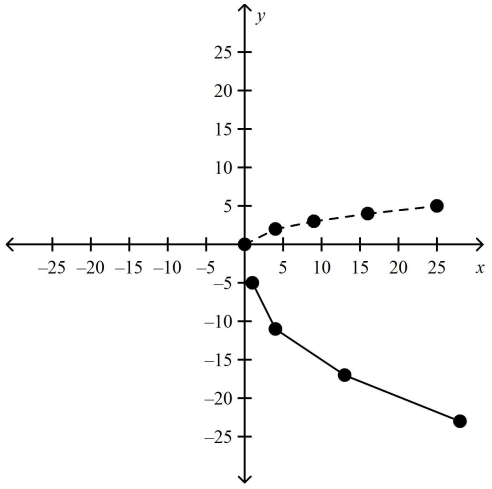
a.



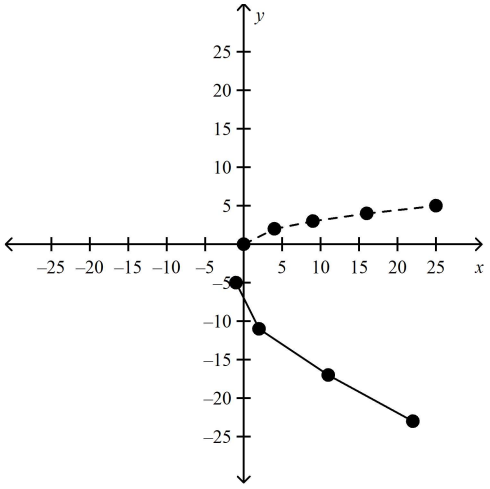
c.



b.



d.



____ 10. Simplify.

$(6n^2 - 3n + 9) - (n^2 + 3n - 5)$

a. $5n^2 + 4$
b. $5n^2 - 6n + 14$
c. $7n^2 + 14$
d. $7n^2 + 6n + 4$

____ 11. A rectangle has length $(3x + 5)$ cm and width $(2x - 1)$ cm. What is the area of the rectangle?

a. $5x + 4$ cm^2
b. $6x^2 - 5$ cm^2
c. $6x^2 + 7x - 5$ cm^2
d. $6x^2 + 13x - 5$ cm^2

____ 12. Expand and simplify.

$(2x - 7)(-4x + 5)$

a. $-8x^2 + 38x - 35$
b. $8x^2 - 38x - 35$
c. $-8x^2 + 35$
d. $-8x^2 + 18x + 35$

____ 13. Which of the following are factors for the polynomial $6x^2 + 36x + 54$?

a. $(2x + 6)(3x + 3)$
c. $3(x + 6)(x + 3)$
b. $6(x + 3)(x + 3)$
d. $6(x + 9)(x + 6)$

____ 14. Which of the following are factors for the polynomial $9x^2 - 16$?

a. $(9x - 16)(x + 1)$
c. $(9x + 4)(x - 4)$
b. $(3x - 4)(3x - 4)$
d. $(3x + 4)(3x - 4)$

____ 15. Simplify.

$$\frac{3x^2 + 6x}{2x + 4}$$

a. $\frac{3x^2}{2}$
c. $3x$
b. $x + \frac{3x}{2}$
d. $\frac{3x}{2}$

____ 16. What are the restrictions on the variable for $\frac{d^2 + 10d + 25}{5d^2 - 25d}$?

a. $d \neq -5, 0, 5$
c. $d \neq 0, 5$
b. $d \neq 0$
d. No restrictions

____ 17. Simplify.

$$\frac{3x}{14x^2} \times \frac{7x^2}{15x}$$

a. $\frac{1}{10x^3}$
c. $\frac{1}{10}$
b. $\frac{x^3}{10}$
d. $53x^2$

____ 18. Simplify.

$$\frac{p - 2}{3p + 3} \times \frac{9p + 9}{p + 2}$$

a. $-\frac{3}{2p + 1}$
c. $\frac{3(p^2 - 2)}{p^2 + 2}$
b. –3
d. $\frac{3(p - 2)}{p + 2}$

____ 19. Simplify.

$$\frac{4x - 5}{6} \div \frac{8x - 10}{12}$$

a. $48x - 60$
c. $\frac{(4x - 5)(4x - 5)}{24}$
b. 1
d. $8x - 10$

____ 20. Simplify.

$$\frac{6r^3 - 6r^2}{r^4 + 5r^3} \div \frac{3r^2 - 15r + 12}{2r^2 + 2r - 40}$$

a. $\dfrac{9(r-1)(r-1)}{r(r+5)(r+5)}$

b. $\dfrac{-14}{r - 13r^2}$

c. $\dfrac{r}{9}$

d. $\dfrac{4}{r}$

____ 21. Simplify.

$$\frac{7}{3g} + \frac{2}{5g^4}$$

a. $\dfrac{35g^3 + 6}{30g^4}$

b. $\dfrac{9}{8g^5}$

c. $\dfrac{41}{15g}$

d. $\dfrac{35g^3 + 6}{15g^4}$

____ 22. Simplify.

$$\frac{4}{x+2} - \frac{3}{x-1}$$

a. $\dfrac{x - 10}{(x+2)(x-1)}$

b. $\dfrac{1}{(x+2)(x-1)}$

c. 1

d. $\dfrac{1}{(x-1)}$

____ 23. Simplify.

$$\frac{1}{t^2 + 5t + 4} + \frac{5t}{3t + 3}$$

a. $\dfrac{5t + 1}{(t+1)(t+7)}$

b. $\dfrac{5t^2 + 20t + 1}{3(t+4)(t+1)}$

c. $\dfrac{5t^2 + 20t + 3}{3(t+4)(t+1)}$

d. $\dfrac{5t}{3(t+4)(t+1)^2}$

____ 24. Which of the following is true about the parabola for the function $f(x) = 3(x - 4)^2 + 5$?

a. The y-intercept is 0.
b. The vertex is (4, 5).
c. The axis of symmetry is $x = -4$.
d. The parabola opens down.

____ 25. The points (–3, 5) and (7, 5) are the same distance from the vertex of their parabola. What is the equation for the axis of symmetry of the parabola?

a. $x = 5$
b. $x = 0$
c. $x = -3$
d. $x = 2$

____ 26. The Canada Calendar Company reduces the prices of its calendars each January. The function $f(x) = -25(x - 9)^2 + 200$ models the company's profits, where x is the price of a calendar in dollars. At what calendar price will the company receive maximum profits?

a. \$5
c. \$10
b. \$9
d. \$15

____ 27. Which of the following quadratic functions will have a minimum value?

a. $h(x) = -3(x + 4)^2 + 8$
c. $f(x) = 2x^2 + 9x - 13$
b. $g(x) = -5x^2 + 3x + 7$
d. $y = -(x - 6)^2 - 15$

____ 28. What is the minimum value for the function $f(x) = 4.5x^2 - 7.1x + 3.9$? Round to two decimal places.

a. 0.79
c. 3.90
b. 1.10
d. 6.70

____ 29. What is the minimum value for the function $f(x) = 4x^2 - 8x + 16$?

a. –12
c. 12
b. 1
d. 16

____ 30. Which of the following expresses $\sqrt{96}$ in simplest form?

a. $6\sqrt{3}$
c. $4\sqrt{6}$
b. $16\sqrt{6}$
d. $8\sqrt{2}$

____ 31. Which of the following expresses $\sqrt{8} \times \sqrt{32}$ in simplest form?

a. $2\sqrt{64}$
c. $8\sqrt{2}$
b. 16
d. $4\sqrt{8}$

____ 32. Which of the following expresses $16\sqrt{10} + 2\sqrt{10}$ in simplest form?

a. 180
c. $36\sqrt{5}$
b. $18\sqrt{10}$
d. 320

____ 33. Which of the following expresses $8\sqrt{200}$ in simplest form?

a. $80\sqrt{2}$
c. 160
b. $40\sqrt{5}$
d. $18\sqrt{2}$

____ 34. Which of the following expresses $3\sqrt{7} - 2\sqrt{28}$ in simplest form?

a. –1
c. $-\sqrt{21}$
b. $-5\sqrt{7}$
d. $-\sqrt{7}$

____ 35. Which of the following are roots of the equation $x^2 - 3x - 28 = 0$?

a. $x = -4, 7$
c. $x = -7, 4$
b. $x = -28, 0$
d. $x = -24, 4$

____ 36. Which of the following are approximate roots of the equation $2x^2 - 13x + 8 = 0$?

a. $x \doteq 0.4, 0.67$
c. $x \doteq 1.38, 11.63$
b. $x \doteq 0.69, 5.81$
d. $x \doteq -13.13, 3.25$

____ 37. A model rocket is launched off the top of a table. The height of the rocket is given by the function $h(t) = -4.9t^2 + 92t + 1.2$, where $h(t)$ is the height in metres and t is the time in seconds. How long will it take for the rocket to reach the ground?

a. 0.13 s
c. 18.79 s
b. 18.76 s
d. 0.13 s and 18.79 s

____ 38. How many zeros are in the solution to the function $g(x) = x^2 - 3x + 4$?

a. 0
c. 2
b. 1
d. 3

____ 39. Which of the following is equivalent to the expression 8^{-6}?

a. $\sqrt[6]{8}$
c. $\frac{1}{8^6}$
b. $\frac{6}{8}$
d. $(-8)^6$

____ 40. Which of the following is equivalent to the expression $\left(5^{-4}\right)\left(5^7\right)$?

a. 5^3
c. 25^3
b. $\frac{1}{5^{28}}$
d. $\frac{1}{5^{11}}$

____ 41. Which of the following is equivalent to the expression $12^{-4} \times \frac{12^2}{\left(12^3\right)^{-1}}$?

a. $\frac{1}{12^4}$
c. 12^9
b. $\frac{1}{12^9}$
d. 12

____ 42. What is $\sqrt[3]{-125^4}$ in exponent form?

a. $(-5)^{\frac{4}{3}}$
c. $(-125)^{\frac{3}{4}}$
b. $125^{-\frac{3}{4}}$
d. $(-125)^{\frac{4}{3}}$

____ 43. Which of the following is equivalent to the expression $\left(a^3b^4\right)^{-2}\left(a^{-3}b^{-5}\right)^{-4}$?

a. a^6b^{12}
c. $\frac{1}{a^6b^{12}}$
b. $a^{12}b^{15}$
d. $\frac{1}{a^6b^7}$

____ 44. Which of the following is equivalent to the expression $\left(\frac{\left(3j^{-3}k^{6}\right)^{4}}{j^{-2}k^{-8}}\right)^{\frac{1}{2}}$?

a. $\frac{j^{20}}{162k^{64}}$

b. $\frac{9k^{16}}{j^{5}}$

c. $\frac{9k^{8}}{j^{5}}$

d. $\frac{40.5k^{16}}{j^{5}}$

____ 45. Which function describes exponential decay?

a. $f(x) = 6(1.01)^{x}$

b. $f(x) = 3.4(40)^{2x}$

c. $f(x) = 25(0.8)^{x}$

d. $f(x) = 8(17)^{\frac{x}{4}}$

____ 46. The growth in population of a town since 2000 is given, in thousands, by the function $P(n) = 36.5(1.06)^{n}$. In which year will the population expect to reach 70 000?

a. 2008

b. 2010

c. 2011

d. 2013

____ 47. A 300 g sample of thorium-234 has a half-life of 24 days. The mass of thorium, in grams, that remains after t days can be modelled by $M(t) = 300\left(\frac{1}{2}\right)^{\frac{t}{24}}$. What mass will remain after 31 days?

a. 122.5 g

b. 150 g

c. 177.5 g

d. 193.75 g

____ 48. The population of a small village has grown at an annual rate of approximately 5.5%. How long will it take for its population of 3200 people to double at this growth rate?

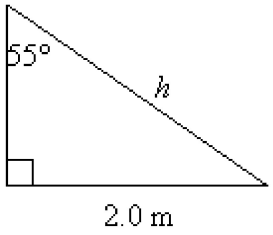
a. about 1.5 years

b. about 11 years

c. about 13 years

d. about 16 years

____ 49. Determine the length of the hypotenuse of the triangle to the nearest tenth of a metre.



a. 3.1 m

b. 2.4 m

c. 2.1 m

d. 2.9 m

____ 50. Determine the exact value of $\cos 60° \times \sin 30°$.

a. $\frac{\sqrt{2}}{2}$
c. $\frac{\sqrt{3}}{2}$
b. $\frac{1}{4}$
d. 1

____ 51. Using the appropriate special triangle, determine θ if $0° \le \theta \le 90°$ for $\cos\theta = \frac{\sqrt{3}}{2}$.

a. 30°
c. 45°
b. 60°
d. 90°

____ 52. For the angle $\theta = 150°$ moving counter-clockwise in standard position, determine which primary trigonometric ratio is positive.

a. sine
c. tangent
b. cosine
d. none are positive

____ 53. Angle θ lies in quadrant 3. Without using a calculator, determine which ratio is valid.

1) $\sin\theta = 0.789$
2) $\tan\theta = -0.573$
3) $\sin\theta = -1.083$
4) $\tan\theta = 0.841$

a. **1)**
c. **3)**
b. **2)**
d. **4)**

____ 54. Use the trigonometric ratio $\cos\theta = 0.6798$ to determine which of the following is the correct value of θ to the nearest degree if $0° \le \theta \le 360°$.

a. 133°
c. 227°
b. 313°
d. 225°

____ 55. $P(2,-3)$ lies on the terminal arm of an angle in standard position. What is the value of the principal angle θ to the nearest degree?

a. 56°
c. 236°
b. 146°
d. 304°

____ 56. Determine the correct simplification of the expression $(1+\cos\alpha)(1-\cos\alpha)$.

a. $1-\sin^2\alpha$
c. $\sin^2\alpha$
b. $\cos^2\alpha$
d. $1+\cos^2\alpha$

____ 57. Determine the correct simplification of the expression $\tan^2\alpha\cos^2\alpha+\cos^2\alpha$.

a. $\sin^2\alpha$
c. $\sin^2\alpha+\cos^2\alpha$
b. $\cos^2\alpha$
d. 1

____ 58. Which of the following completes the missing step to the following proof.

$\frac{\cos^2\theta}{1-\sin\theta} = 1+\sin\theta$

L.S.:

$\frac{\cos^2\theta}{1-\sin\theta}$

$= ???$

$= \frac{(1-\sin\theta)(1+\sin\theta)}{1-\sin\theta}$

$= 1+\sin\theta$

= R.S.

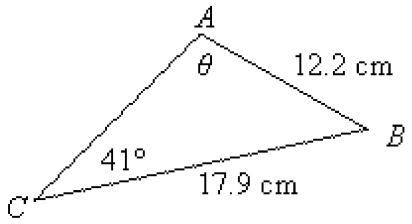
a. $\frac{1-\sin^2\theta}{1-\sin\theta}$

b. $\frac{\cos^2\theta+\sin^2\theta}{1-\sin\theta}$

c. $\frac{\cos^2\theta}{1-\sin\theta}\cdot\frac{1+\sin\theta}{1+\sin\theta}$

d. $\frac{\cos^2\theta}{1-\sin\theta}\cdot\frac{\sin^2\theta}{\sin^2\theta}$

____ 59. Determine the measure of the angle θ to the nearest degree.



a. $\theta = 78°$

b. $\theta = 72°$

c. $\theta = 74°$

d. $\theta = 69°$

____ 60. Determine $\angle B$ to the nearest degree for the triangle with the given information.

$a = 3.7$ m, $b = 4.9$m, $\angle A = 46°$

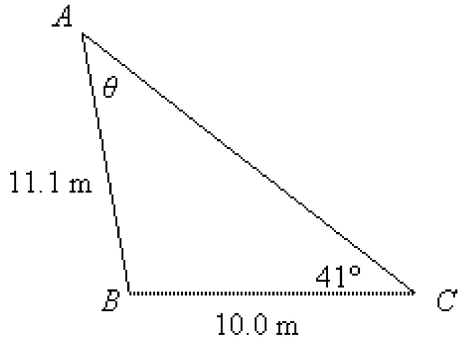
a. $\angle B = 59°$

b. $\angle B = 53°$

c. $\angle B = 72°$

d. $\angle B = 61°$

____ 61. Determine the measure of the angle θ to the nearest degree.



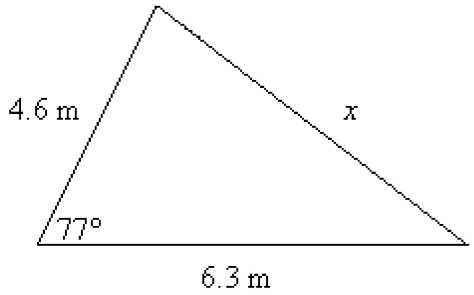
a. $\theta = 47°$

b. $\theta = 39°$

c. $\theta = 36°$

d. $\theta = 41°$

____ 62. Determine x to the nearest tenth of a metre.



a. 7.5 m
b. 7.9 m
c. 6.2 m
d. 6.9 m

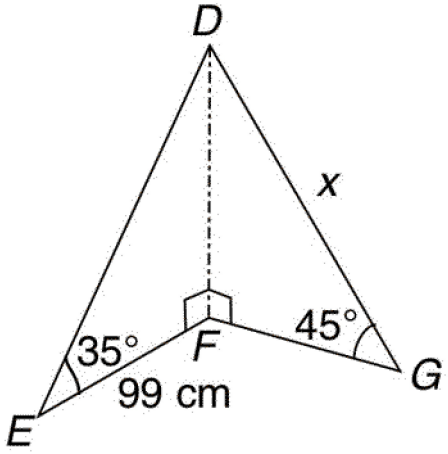
____ 63. In $\triangle ABC$, $a = 5.4$ m, $b = 7.2$ m, and $c = 10.0$ m. Determine $\angle C$ to the nearest degree.

a. 92°
b. 97°
c. 104°
d. 108°

____ 64. In $\triangle ABC$, $a = 9.4$ m, $b = 16.1$ m, and $\angle C = 68°$. Determine $\angle B$ to the nearest degree.

a. $\angle B = 77°$
b. $\angle B = 85°$
c. $\angle B = 67°$
d. $\angle B = 82°$

____ 65. Determine the value of x to the nearest cm.



a. 47 cm
b. 68 cm
c. 74 cm
d. 98 cm

____ 66. Frank is riding a Ferris wheel, where t is time in seconds. Suppose the Ferris wheel is 20 m tall. Let $h(t) = 10\cos(12t)$ represent the height of Frank in m above or below the centre of the Ferris wheel. How long does it take to make two complete cycles on the Ferris wheel? Assume there are no stops.

a. 60 s
b. 30 s
c. 45 s
d. 120 s

____ 67. A spring bounces up and down according to the model $d(t) = 6\cos(60t) - 2$, where $d(t)$ is the displacement in cm from the rest position and t is time in seconds. What is the range?

a. $\{y \in \mathbf{R} | -6 \le y \le 6\}$
b. $\{y \in \mathbf{R} | -2 \le y \le 6\}$
c. $\{y \in \mathbf{R} | -6 \le y \le 8\}$
d. $\{y \in \mathbf{R} | -8 \le y \le 4\}$

____ 68. Without graphing, determine the equation of the axis of the function $y = -2.6\cos(5x) + 8.4$.

a. $y = 2.6$
c. $y = 5$
b. $y = 8.4$
d. $y = 0$

____ 69. Without graphing, determine the period of the function $y = 3.7\sin(15x) - 0.1$.

a. 24
c. 30
b. 15
d. 3.7

____ 70. Determine the equation of a sine function that would have a range of $\{y \in \mathbf{R} | 6 \le y \le 9\}$ and a period of 60°.

a. $y = 3\sin(12x) + 6$
c. $y = 1.5\sin(6x) + 7.5$
b. $y = 3\sin(12x) + 9$
d. $y = \sin(6x) + 9$

____ 71. For an investment of $20 000 at 7.2%/a compounded semi-annually for 7 years, what is the total interest earned?

a. $12 814.56
c. $32 936.72
b. $32 814.56
d. $52 936.72

____ 72. Maureen invests $1500 every 3 months at 5.2%/a compounded quarterly for 5 years. How much interest will she earn after the 5th year?

a. $821.62
c. $4010.64
b. $1942.14
d. $34 010.64

____ 73. Fayad wants to invest money every month for 25 years. He would like to have $250 000 at the end of the 25 years. If he invests in an account at 6.6%/a compounded monthly, how much does he need to invest each month?

a. $328.67
c. $1881.90
b. $760.64
d. $4185.36

____ 74. Every 6 months, Lucy invests $900 at 2.8%/a compounded semi-annually for 12 years. What is the value of the first investment at the end of 12 years?

a. $925.20
c. $1256.47
b. $1239.13
d. $1274.06

____ 75. Sal and Kendra each invest $400 every month for 5 years. Sal's bank gives him 5.4%/a compounded monthly. Kendra's bank gives her 6%/a compounded monthly. How much more will Kendra have in her account at the end of 5 years?

a. $240.00
c. $572.72
b. $426.12
d. $27 908.01