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8 - 3

Identify the dependent and the independent variables for each situation below. Write the function. Then evaluate the function for the given input values.

1. A computer support company charges $295 for the first hour plus $95 for each additional hour.

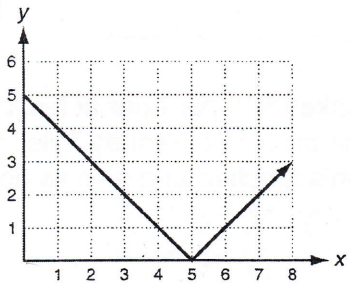
Dependent $f(x)$: cost Function: $f(x) = 295 + 95x$

Independent x: hours Evaluate for $x = 2$ & 7 $f(2) = 485$

$f(7) = 960$

9 - 1

Use this graph of $f(x) = |5 - x|$ to find these values.



4. $f(x) =$ 3 when $x = 2$
5. $f(x) =$ 1 when $x = 6$
6. $x =$ 5 when $f(x) = 0$

9 - 3

Determine whether each sequence is an arithmetic sequence. If so, find the common difference and the next three terms.

1. –1, 2, –3, 4, ... Not arithmetic

2. 1.25, 3.75, 6.25, 8.75, ... yes, $d = 2.5$

11.25, 13.75, 16.25

Use the first term and common difference to write the rule for each arithmetic sequence.

3. The arithmetic sequence with first term $a_1 = 10$ and common difference $d = 4$.

$a_n = a_1 + (n-1)d$

$a_n = 10 + (n-1)4$

$a_n = 10 + 4n - 4$

$a_n = 14 + 4n$

4. –5, 0, 5, 10, ...

$a_1 = -5$ $d = 5$

$a_n = -5 + (n-1)5$

$a_n = -5 + 5n - 5$

$a_n = -10 + 5n$

Find the indicated term of each arithmetic sequence.

5. $a_n = 16 + (n - 1)(-0.5)$

$a_{15} = 16 + (15-1)(-0.5)$

$a_{15} = 16 + (14)(-0.5)$

$16 - 7$

15th term: $a_{15} = 9$

6. –8, –6, –4, –2, ...

$d = 2$

$a_{100} = -8 + (100-1)2$

$-8 + (99)2$

$-8 + 198$

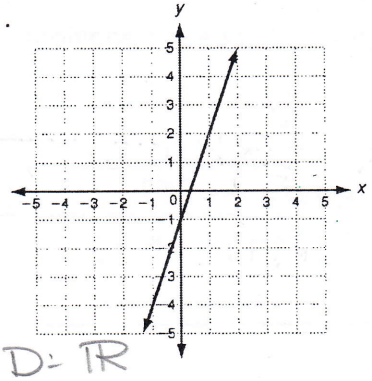
$a_{100} = 190$

100th term: $a_{100} = 190$

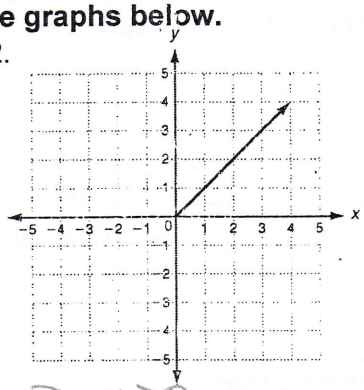
Name _____ Date _____ Class _____

10 - 1

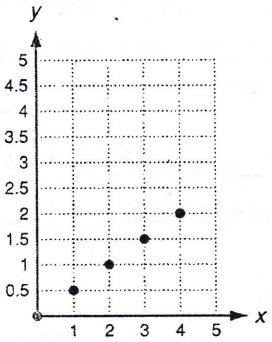
Give the domain and range for the graphs below.

1. 

D: ℝ
R: ℝ

2. 

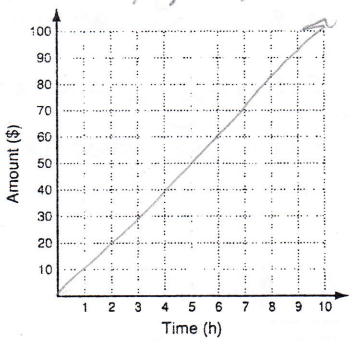
D: $x \geq 0$
R: $y \geq 0$

3. 

D: 0, 1, 2, 3, 4
R: 0.5, 1, 1.5, 2

4. Tyler makes $10 per hour at his job. The function $f(x) = 10x$ gives the amount of money Tyler makes after x hours. Graph this function and give its domain and range.

D: $x \geq 0$
R: $y \geq 0$



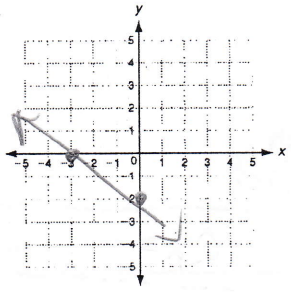
10 - 2

Find the x & y intercepts and graph the line.

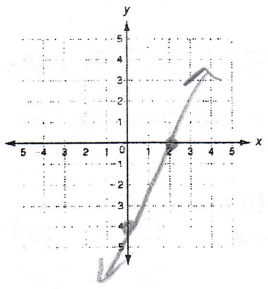
1. $4x + 6y = -12$

$4x + 6(0) = -12$
$4x = -12$
$x = -3$

$4(0) + 6y = -12$
$6y = -12$
$y = -2$



2. $2x - y = 4$

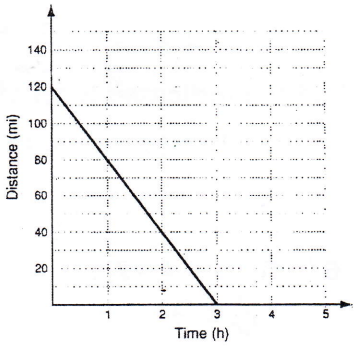


$2x - 0 = 4$
$2x = 4$
$x = 2$

$2(0) - y = 4$
$-y = 4$
$y = -4$

4. The volleyball team is traveling to a game 120 miles away. Their average speed is 40 mi/h. The graphed line describes the distance left to travel at any time during the trip. Find the intercepts. What does each intercept represent?

x-int = 3 → 3 hrs and 0 miles left to travel
y-int = 120 → distance to travel at time = 0



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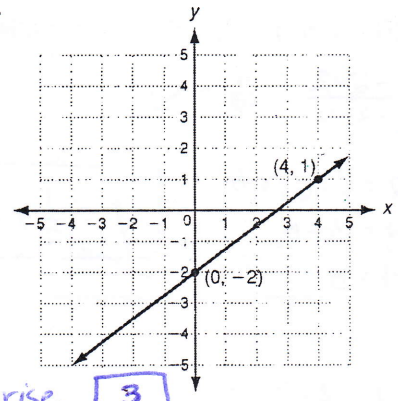
10 - 3/10 - 4

Find the slope of each linear relationship.

1. 

rise / run = 3/4

2.

x	y
4	−5
8	−3
12	−1
16	1

+4, +2

Slope = $\frac{y}{x} = \frac{2}{4} = \frac{1}{2}$

3. The line contains (5, −2) and (7, 6).

$\frac{6-(-2)}{7-5} = \frac{8}{2} = 4$

Find the slope of the line described by each equation.

4. $-2x - 5y = 10$

$\frac{-5y}{-5} = \frac{2x}{-5} + \frac{10}{-5}$

$y = -\frac{2}{5}x - 2$

slope $= -\frac{2}{5}$

5. $4x + 2y = 8$

$\frac{2y}{2} = \frac{-4x}{2} + \frac{8}{2}$

$y = -2x + 4$

slope $= -2$

11 - 1

Tell whether each equation or relationship is a direct variation. If so, identify the constant of variation.

1.

x	−4	2	10
y	2	−1	−5

$\frac{2}{-4} = -\frac{1}{2}$, $\frac{-1}{2} = -\frac{1}{2}$, $\frac{-5}{10} = -\frac{1}{2}$ — all the same

yes, direct. $k = -\frac{1}{2}$

2. $-8y = 24x$

$\frac{-8y}{-8} = \frac{24x}{-8}$

$y = -3x$

yes, direct. $k = -3$

11 - 2

Write the equation that describes each line in slope-intercept form.

1. slope is 3, (4, 6) is on the line.

$y = mx + b$

$6 = 3(4) + b$

$6 = 12 + b$

$-6 = b$

$y = 3x - 6$

2. slope is $\frac{1}{2}$, (−2, 8) is on the line.

$8 = \frac{1}{2}(-2) + b$

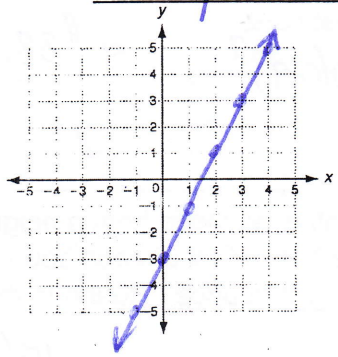
$8 = -1 + b$

$9 = b$

$y = \frac{1}{2}x + 9$

3. Write $2x - y = 3$ in slope-intercept form. Then graph the line.

$y = 2x - 3$



Name _____ Date _____ Class _____

11 - 3

Write the equation that describes the line in slope-intercept form.

1. (1, 2) and (3, 12) are on the line

$y = mx + b$

$\frac{12-2}{3-1} = \frac{10}{2} = 5$

$2 = 5(1) + b$

$-3 = b$

$y = 5x - 3$

2. (6, 2) and (–2, –2) are on the line

$\frac{-2-2}{-2-6} = \frac{-4}{-8} = \frac{1}{2}$

$2 = \frac{1}{2}(6) + b$

$2 = 3 + b$

$-1 = b$

$y = \frac{1}{2}x - 1$

11 - 4

List the transformations from the parent function $y = x$.

1. $y = -\frac{1}{4}x - 6$

reflect over x-axis; vertical shrink by $\frac{1}{4}$; shift down 6

2. $y = 2x + 2$

vertical stretch by 2; shift up 2

12 - 1

Find the next three terms in each geometric sequence. $a_n = a_1 \cdot r^{n-1}$

1. –5, –10, –20, –40, –80, –160, –320 (×2)

2. 40, 10, $\frac{5}{2}$, $\frac{5}{8}$, $\frac{5}{32}$, $\frac{5}{128}$, $\frac{5}{512}$ (×$\frac{1}{4}$)

3. The first term of a geometric sequence is 6 and the common ratio is –8. Find the 7th term.

$a_n = a_1 \cdot r^{n-1}$ $a_7 = 6(-8)^6 = 1{,}572{,}864$

4. What is the 12th term of the geometric sequence –4, –12, –36, …?

$a_{12} = -4(3)^{11} = -708{,}588$

5. A shoe store is discounting shoes each month. A pair of shoes cost $80. The table shows the discount prices for several months. Find the cost of the shoes after 8 months. Round your answer to the nearest cent.

Month	Price
1	$80.00
2	$72.00
3	$64.80

$\frac{72}{80} = 0.9$ (×0.9) $\frac{64.80}{72} = 0.9$

$a_8 = 80(0.9)^7 \approx \$38.26$

12 - 2

1. If a basketball is bounced from a height of 15 feet, the function $f(x) = 15\,(0.75)^x$ gives the height of the ball in feet of each bounce, where x is the bounce number. What will be the height of the 5th bounce? Round to the nearest tenth of a foot.

$15(0.75)^5 \approx 3.55957 \approx 3.6$ ft

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Tell whether each set of ordered pairs satisfies an exponential function. Explain your answer.

2. {(2, 4), (4, 8), (6, 16), (8, 32)}

×2 ×2 ×2

yes, multiplying by 2

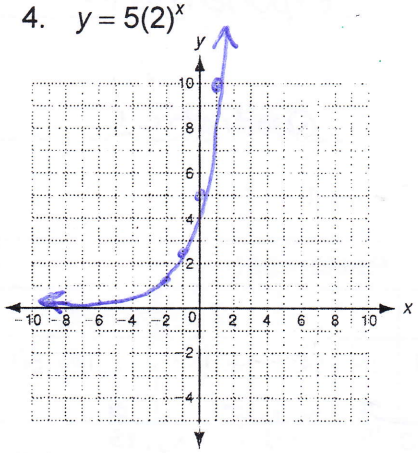
3. {(−2, 5), (−1, 10), (0, 15), (1, 20)}

+5 +5 +5

no, it's adding 5

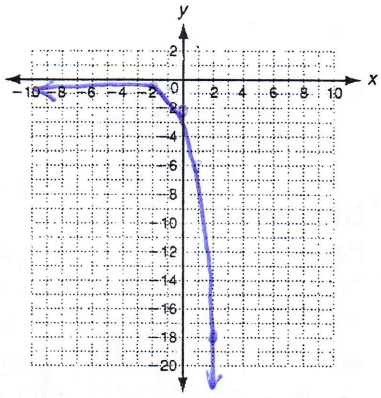
Graph each exponential function.

4. $y = 5(2)^x$



x	y
−2	1.25
−1	2.5
0	5
1	10
2	20

5. $y = -2(3)^x$



x	y
−2	$-0.\overline{2}$
−1	$-0.\overline{6}$
0	−2
1	−6
2	−18

Write an exponential growth or decay function to model each situation. Then find the value of the function after the given amount of time. $y=a(1+r)^t$ or $y=a(1-r)^t$

1. Annual sales for a fast food restaurant are $650,000 and are increasing at a rate of 4% per year; 5 years

$y = 650{,}000(1+0.04)^5$

$\approx \$790824.39$

2. The value of a company's equipment is $25,000 and decreases at a rate of 15% per year; 8 years

$y = 25{,}000(1-0.15)^8$

$\approx \$6812.26$

3. The half-life of Iodine-131 is approximately 8 days. Find the amount of Iodine-131 left from a 35 gram sample after 32 days.

$32 \div 4$

$y = 35(0.5)^4$

$= 2.1875$ grams

Write a compound interest function to model each situation. Then find the balance after the given number of years.

4. $50,000 invested at a rate of 3% compounded monthly; 6 years

$A = 50{,}000\left(1+\frac{0.03}{12}\right)^{12 \cdot 6}$

$\$59,847.42$

5. $65,000 invested at a rate of 6% compounded quarterly; 12 years

$A = 65{,}000\left(1+\frac{.06}{4}\right)^{4 \cdot 12}$

$\$132,826.09$

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13 - 1

Look for a pattern in each data set to determine which kind of model best describes the data (linear, quadratic, cubic, or exponential).

1. {(–5, 9), (–4, 0), (–3, –7), (–2, –12)}

x	–5	–4	–3	–2
y	9	0	–7	–12

–9 –7 –5 ← 1st row
+2 +2 ← 2nd row

Quadratic

2. {(1, 4), (2, 6), (3, 9), (4, 13.5)}

x	1	2	3	4
y	4	6	9	13.5

+2 +3 +4.5
×1.5 ×1.5 ×1.5

exponential

3. {(0, 4), (2, 12), (4, 36), (6, 76)}

x	0	2	4	6
y	4	12	36	76

+8 +24 +40 ← 1st row
+16 +16 ← 2nd row

Quadratic

4. Use the data in the table to describe how the restaurant's sales are changing. Then write a function that models the data. Use your function to predict the amount of sales after 8 years.

Restaurant				
Year	0	1	2	3
Sales ($)	20,000	19,000	18,050	17,147.50

×0.95 ×0.95 ×0.95

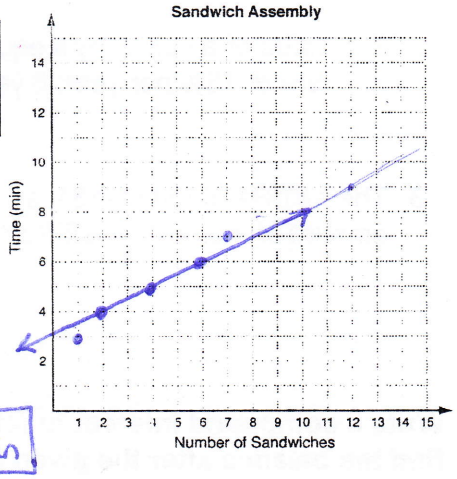
$a_8 = 20{,}000(0.95)^7 = \$13{,}966.75$

(Unit 14—Data should be very familiar. Review last test.)

15 - 1

Neal kept track of the number of minutes it took him to assemble sandwiches at his restaurant. The information is in the table below.

Number of sandwiches	1	2	4	6	7
Minutes	3	4	5	6	7



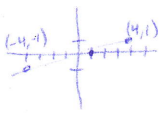
1. Graph a scatter plot of the data.
2. Draw a trend line.
3. Describe the correlation.

positive

4. Based on the trend line you drew, predict the amount of time it will take Neal to assemble 12 sandwiches.

9 min

16 - 1



1. A figure has vertices at $G(0, 0)$, $H(–1, –2)$, $I(–1.5, 0)$, and $J(–2.5, 2)$. Find the coordinates for the image of $GHIJ$ after the translation $(x, y) \rightarrow (x – 2.5, y + 4)$.

G'(–2.5, 4) H'(–3.5, 2) I'(–4, 4) J'(–5, 6)

2. A figure has vertices at $X(–1, 1)$, $Y(–2, 3)$, and $Z(0, 4)$. Find the coordinates of the image of XYZ after the translation $(x, y) \rightarrow (x – 2, y)$ and a 180° rotation around the origin.

X'(–3, 1) Y'(–4, 3) Z'(–2, 4)
X''(3, –1) Y''(4, –3) Z''(2, –4)

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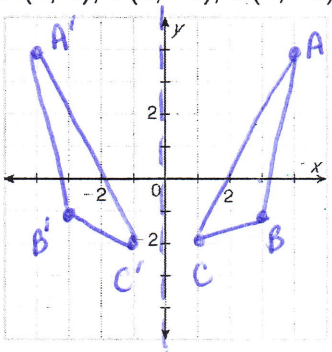
16 - 2

Reflect the figure with the given vertices across the given line: $(x,y) \to (y,x)$

1. $A(4, 4)$, $B(3, -1)$, $C(1, -2)$; y-axis $(x,y) \to (-x,y)$

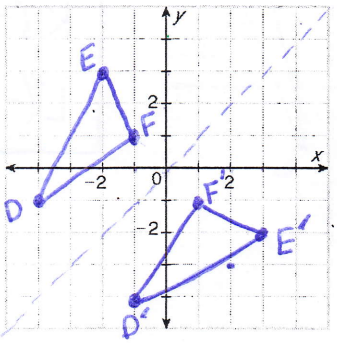


$A'(-4,4)$

$B'(-3,-1)$

$C'(-1,-2)$

2. $D(-4, -1)$, $E(-2, 3)$, $F(-1, 1)$; $y = x$

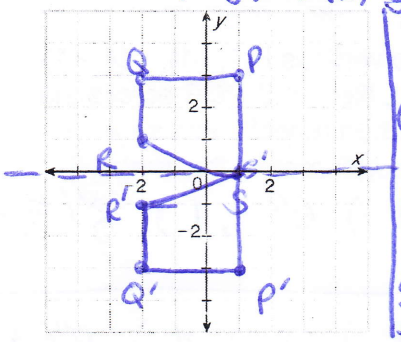


$D'(-1, -4)$

$E'(3, -2)$

$F'(1, -1)$

3. $P(1, 3)$, $Q(-2, 3)$, $R(-2, 1)$, $S(1, 0)$; x-axis $(x,y) \to (x,-y)$



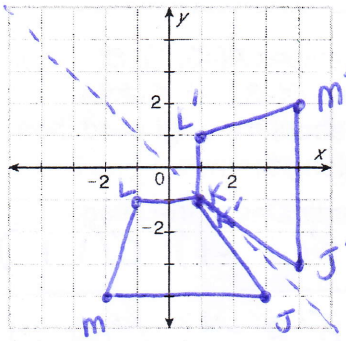
$P'(1, -3)$

$Q'(-2, -3)$

$R'(-2, -1)$

$S'(1, 0)$

4. $J(3, -4)$, $K(1, -1)$, $L(-1, -1)$, $M(-2, -4)$; $y = -x$ $(x,y) \to (-y,-x)$



$J'(4, -3)$

$K'(1, -1)$

$L'(1, 1)$

$M'(4, 2)$

16 - 3

1. A builder is trying to level out some ground with a front-end loader. He picks up some excess dirt at (9, 16) and then maneuvers through the job site along the vectors $\langle -6, 0\rangle$, $\langle 2, 5\rangle$, and $\langle 8, 10\rangle$ to get to the spot to unload the dirt. Find the coordinates of the unloading point. Find a single vector from the loading point to the unloading point.

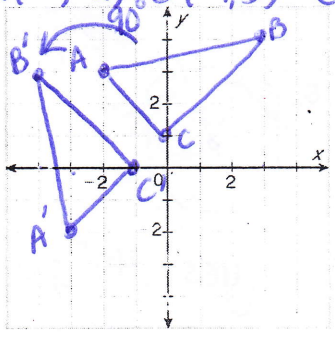
$\to (13, 31)$ $\to \langle 4, 15\rangle$

16 - 4

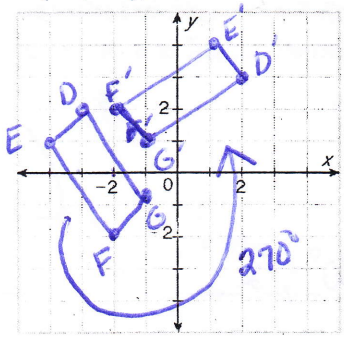
Rotate the figure with the given vertices about the origin using the given angle of rotation. $(x,y) \to (-y,x)$ $(x,y) \to (y,-x)$

1. $A(-2, 3)$, $B(3, 4)$, $C(0, 1)$; 90°

$A'(-3,-2)$ $B'(-4,3)$ $C'(-1,0)$



2. $D(-3, 2)$, $E(-4, 1)$, $F(-2, -2)$, $G(-1, -1)$; 270°



$D'(2, 3)$

$E'(1, 4)$

$F'(-2, 2)$

$G'(-1, 1)$

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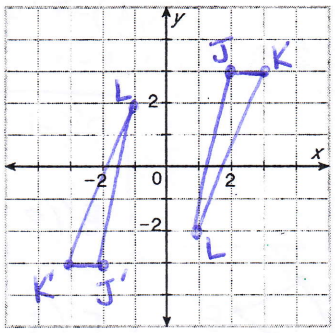
3. $J(2, 3)$, $K(3, 3)$, $L(1, -2)$; 180° $(x,y) \rightarrow (-x,-y)$



$J'(-2, -3)$
$K'(-3, -3)$
$L'(-1, 2)$

17 - 1

1. $ABCD$ has vertices $A(-3, 1)$, $B(-1, 1)$, $C(-1, -1)$, and $D(-3, -1)$. Rotate $ABCD$ 180° about the origin and then translate it along the vector $\langle 1, -3 \rangle$.

   Find the coordinates of the image.

   $A'(3, -1)$ $B'(1, -1)$ $C'(1, 1)$ (+1, −3)

   $A''(4, -4)$ $B''(2, -4)$ $C''(2, -2)$

2. $\triangle PQR$ has vertices $P(1, -1)$, $Q(4, -1)$, and $R(3, 1)$. Reflect $\triangle PQR$ across the x-axis and then reflect it across $y = x$. Find the coordinates of the image.

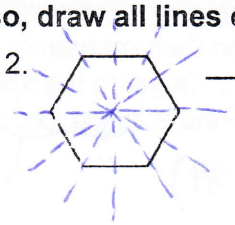
   $P'(1, 1)$ $Q'(4, 1)$ $R'(3, -1)$

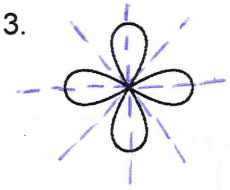
   $P''(1, 1)$ $Q''(1, 4)$ $R''(-1, 3)$

17 - 2

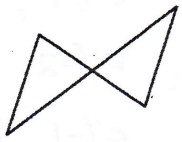
Tell whether each figure has line symmetry. If so, draw all lines of symmetry.

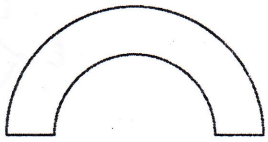
1.  no

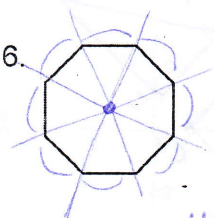
2.  yes

3.  yes

Tell whether each figure has rotational symmetry. If so, give the angle of rotational symmetry and the order of the symmetry.

4.  yes; 180°; order = 2

5.  no

6.  $\frac{360}{8}$ = yes; 45°; order = 8