

## Geometry Applications & Shortest Distance

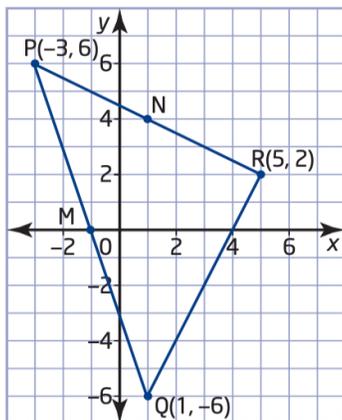
For each question, complete your answers on a separate sheet of lined paper or graph paper.

Then, check your solutions against the final answers on the next page.

As needed, we will take up full solutions in our next class together.

### Questions

2. List two properties you could use to show that a triangle contains a right angle.
3. A triangle has vertices  $C(1, 4)$ ,  $D(-2, 2)$ , and  $E(3, 1)$ .
  - a) Draw  $\triangle CDE$ .
5. In  $\triangle PQR$ ,  $M$  is the midpoint of  $PQ$  and  $N$  is the midpoint of  $PR$ .
  - a) Show that  $MN$  is parallel to  $QR$ .
  - b) Show that  $MN$  is half the length of  $QR$ .
9. Determine whether the triangle with vertices  $A(-3, 4)$ ,  $B(-1, -2)$ , and  $C(3, 2)$  is isosceles.
10. Determine the shortest distance from the point  $(5, 2)$  to the line represented by  $y = 2x + 1$ . Use a diagram to check your answer.
18. a) Draw  $\triangle DEF$  with vertices  $D(-1, 6)$ ,  $E(4, 3)$ , and  $F(0, -4)$ . Then, draw the altitude from vertex  $D$ .
  - b) Find an equation for the altitude from vertex  $D$ .

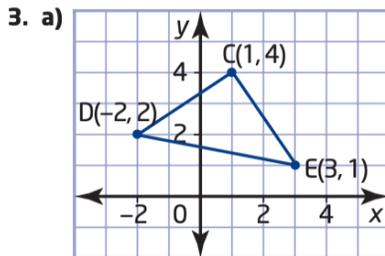


7. A quadrilateral has vertices  $O(0, 0)$ ,  $P(3, 5)$ ,  $Q(8, 6)$ , and  $R(5, 1)$ .
  - a) Determine whether  $OPQR$  is a parallelogram.
  - b) Describe how you could use geometry software to verify your answer to part a).
8. The endpoints of the diameter of a circle are  $M(-3, 5)$  and  $N(9, 7)$ . Determine
  - a) the coordinates of the centre of the circle
  - b) the radius of the circle

**Answers**

*Of course, these are final answers only. Your responses must be complete and fully justified, using mathematics in the form of diagrams and/or algebraic work.*

2. Answers may vary. For example: If the triangle has a right angle, the slopes of two of the sides are negative reciprocals of each other and the lengths of the sides are related by the Pythagorean theorem.



b)  $m_{CD} \times m_{CE} = -1$

5. a)  $m_{MN} = m_{QR} = 2$       b)  $MN = 2\sqrt{5} = \frac{1}{2} QR$

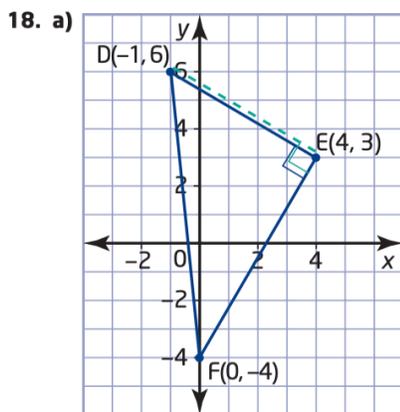
7. a)  $m_{OP} = m_{RQ} = \frac{5}{3}$  and  $m_{PQ} = m_{OR} = \frac{1}{5}$ . Therefore, opposite sides are parallel and OPQR is a parallelogram.

- b) Answers may vary. For example: Use geometry software to construct OPQR and measure the slope of each side. These slopes show that the opposite sides are parallel.

8. a) (3, 6)      b)  $\sqrt{37}$

9. Since  $AB = AC = \sqrt{40}$ ,  $\triangle ABC$  is isosceles.

10.  $\frac{9}{\sqrt{5}}$



b)  $y = -\frac{4}{7}x + \frac{38}{7}$